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The assessment of balance and gait after programmed therapeutic exercises in elderly

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ABSTRACT

Introduction: People over the age of 50 begin to show manifestations of reduced balance and instability, and as a result, simple activities such as standing or getting up from a chair may become limited or impossible. Therapeutic strengthening exercises can increase muscle strength and improve mobility, as well as the physical functioning of the elderly. The aim of this study was to evaluate therapeutic exercise on balance and gait in elderly.

Methods: The prospective study included two groups of 130 respondents over the age of 65 who had come to the "Center for Healthy Aging Novo Sarajevo." Using the Performance-Oriented Mobility Assessment (POMA) test, we assessed mobility performance. We tested the respondents at the beginning, in the middle and in the end of the research, which lasted 6 months.

Results: In the control group, the required time increased by 2.04%. The largest improvement within POMA B was recorded in the examined Group B and it was 12.67 %, while in the examined Group A, the improvement was only 5.07%. Within POMA G, the largest improvement was also recorded in the examined Group B and it was 6.82%, while in the examined Group B, this improvement was 4.14%.

Conclusion: Both strengthening and antigravity therapeutic exercises improve the level of physical fitness in older adults, although therapeutic antigravity exercises had a better impact on the level of physical activity.

Keywords: Third age of life; balance; gait; therapeutic exercise

INTRODUCTION

The fact that the life expectancy has been extended is closely related to the issues of health and social protection of the elderly (1). Aging brings significant changes in physical and mental health, including a decrease in muscle mass and muscle function, which leads to impaired physical ability and reduced quality of life. After the age of 65, a person loses about 1.5% of muscle mass per year. However, muscles in older adults can maintain a relatively high degree of tonus and muscle mass, while tendons become stiff and inelastic and predisposed to injury. Therapeutic strengthening exercises can reduce tendon stiffness and reduce the risk of injuries and damage to the locomotor system. In addition, therapeutic strengthening exercises can increase muscle strength and improve mobility as well as the physical functioning of the persons in elderly (2).

Together with aging, the sensory-nervous reactivity of the organism progressively worsens (3). For these reasons, people of 50 or older begin to show manifestations of reduced balance and instability, so simple activities such as standing or getting up from a chair may become limited or impossible (2,4). Regular participation in moderate physical activity is an integral part of good health and maintaining independence, which contributes to reducing the risk of falls and injuries due to falls. It also prevents the occurrence of many pathological conditions and causes a decrease in functional capacity (5). Researches over the last two decades clearly show that regular therapeutic exercise is an effective tool for maintaining and promoting health, maintaining physical fitness, and functional independence in elderly, especially in terms of endurance, muscle strength, flexibility, and balance (6).

Therapeutic exercise programs can be organized in health centers, commercial fitness centers, and day care centers for the elderly or at home. Unlike exercise in health centers

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or fitness centers, therapeutic exercises organized at home, or day care centers for the elderly do not require special services or expensive equipment. In addition, group therapeutic exercise in day care centers for the elderly provides an opportunity for social contacts and support, from which a person can have a number of benefits, especially those living as singles or those living in rural areas. In order for group therapeutic exercise of the elderly to have its real effect, therapeutic exercises should be simple, combined with appropriate equipment and mutual support (7).

The aim of this study was to evaluate the impact of different therapeutic exercise on balance and gait in older adults.

METHODS

The study was conducted in the "Center for Healthy Aging" Novo Sarajevo in the period from September 1, 2014, to March 1, 2015. There were 260 people older than 65 who were included in the research. The sample was divided into a test group (130 persons) and a control group (130 persons). The test group was divided into subgroup A and subgroup B.

- The study group consisted of 130 respondents who were randomly divided into subgroup A, which consisted of 65 respondents, and subgroup B, which also consisted of 65 respondents. In subgroup A, respondents performed therapeutic exercises to strengthen muscles of moderate intensity with Theraband strips (which should correspond to a score of 11–14 on the Borg scale of perceived effort), and in subgroup B, respondents performed therapeutic antigravity exercises.
- The control group consisted of 130 respondents who came to the "Center for Healthy Aging" Novo Sarajevo and did not want to participate in the programmed therapeutic exercise, but for comparison, were subjected to measurements to assess the presence of risk factors for fall.

The study was designed as an interventional (manipulative), open, randomized, and prospective analytical research.

Therapeutic exercises of the test subgroup A

In the examined subgroup A, the program of therapeutic exercises consisted of therapeutic exercise strengthening of moderate intensity with Theraband strips lasting 40 min. Each session included therapeutic exercises for warming up for 5 min, therapeutic exercises for strengthening with Theraband tape for 30 min, where the subjects were instructed to perform the exercises with moderate intensity. To strengthen the muscles of the torso, upper and lower extremities, we have provided therapeutic exercises of a moderate intensity with the help of elastic bands. Respondents were instructed to gradually, every 2–4 weeks, increase the resistance provided by the tape by switching to the next color of the tape (from the weakest to strongest: yellow, red, green, blue, black, silver, and gold), or the tape was covered at a shorter distance, thus increasing the resistance of the elastic bands. Namely, the subjects increased the resistance of the strips when they were able to report 20 repetitions of a certain movement with little effort.

Strengthening exercises were followed by therapeutic relaxation exercises lasting 5 min. Therapeutic exercises were performed 3 times a week for 40 min a day.

Therapeutic exercises of the test subgroup B

In the examined subgroup B, therapeutic antigravity exercises were used, therapeutic exercises without resistance such as therapeutic breathing exercises, therapeutic coordination exercises, therapeutic balance exercises, therapeutic exercises to increase motion range of the upper and lower extremities, therapeutic exercises to increase mobility lumbar and cervical spine, and therapeutic exercises to tone the muscles of the extremities. Therapeutic exercises were performed 3 times a week for 40 min a day. Programmed therapeutic exercises for both groups lasted continuously for 6 months (8).

The instrument for assessing balance and gait used in the study is the "Performance-Oriented Mobility Assessment (POMA)," and in the original POMA version used in this clinical trial, there are eight elements of balance (POMA-B) and eight elements of the way of walking (POMA-G), which is scored through a scale of 2–3 points (9-11). Balance elements include balance when sitting, getting up from a chair, sitting down, standing (eyes open and closed), and balance while rotating with a maximum total of 12 points (POMA-B). Elements of the way of gait include the initiation of the walk, the length of the steps, the symmetry of the length of steps and continuity, the direction of the path, the bending of the torso, with a maximum sum of 16 points (POMA-G). The total (POMA-T) ranges from 0 to 28 points. Lower results on the scale indicate poorer mobility. This test was performed on each subject at the beginning, middle, and in the end of the study.

The research was approved by the Ethics Committee of the Faculty of Health Studies, University of Sarajevo, Approval number 04-7-96/13. It was conducted exclusively on a voluntary basis, and consent for participation in the research was obtained from each respondent. The identities of the respondents were protected in accordance with ethical and privacy principles.

SPSS for Windows (version 20.0, SPSS Inc, Chicago, Illinois, USA) and Microsoft Excel (version 10. Microsoft Corporation, Redmond, WA, USA) were used for statistical analysis of the obtained data. Descriptive analysis of sociodemographic and baseline clinical characteristics was performed, including the frequency of categorical variables and means with standard deviation for quantitative variables. Baseline data were analyzed to calculate differences between groups using ANOVA for quantitative variables and Chi-square for qualitative variables.

RESULTS

The analysis of the gender structure of the control and test groups, using the Chi-square test, found a statistically significant difference, as in the test group, there were more female respondents than in the control group, χ^2 = 50,620; p = 0.001. In the control group, there were 55% male respondents and 45% female respondents. In the test Group A, there were 12.3% male and 87.8% female

respondents, while in the test Group B, the percentage of male respondents was 6.1% and female respondents 93.3%.

There was no statistically significant difference in the average age of the respondents in the test groups, F = 1.22; $p = 0.297$. The average age of the respondents in the control group was 73.25 ± 6.69 years (65–87), while in the respondents of the test Group A, it was 71.28 ± 5.21 years (65–84), and in the test Group B 72.56 ± 5.15 years (65–85).

By analyzing the balance in the sitting position during all three tests, we came to the data that the respondents of the test Groups A and B had a statistically significantly better balance in the sitting position compared to the respondents of the control group, $p = 0.019$. At the end of the study, 95.4% of respondents in the test Group B, 89.2% of the respondents in the test Group A, and 84.6% respondents in the control group had the highest score 2. The results obtained during the task, in which the respondents get up from the chair, show that the subjects of the test Group A at the end of the study had a statistically significantly better score at getting up from the chair than the subjects of the test Group B and the control group, $p = 0.015$. The results obtained during the task, in which the respondents sit down in a chair show that the respondents of the test Group B had statistically significantly better sitting down on a chair than the respondents of the test Group A and the control group, $p = 0.047$. The average number of respondents with score of 2 at the end of the study in the test Group B was 69.2%, in the test Group A 61.5%, and in the control group 62.3% of respondents (Table 1).

At the end of the study, 53.8% of test Group A respondents, 46.2% of test Group B respondents, and 42.3% of control group respondents had a score 2. By valorizing the results related to the balance test at the beginning (first 5 s), we obtained data showing that the respondents of the test Group B after the third measurement had significantly better balance in the initial 5 s compared to the control group and the test Group A. About 72.3% of the respondents in the test Group B, 70.8% respondents in the test Group A, and 67.7% of the respondents in the control group had a score 2 at the end of the study. By analyzing the results related to the standing balance test (after 5 s), we obtained data that the respondents of the test Group B had a statistically significantly better standing balance (after 5 s) after the third test than the respondents of the test Group A and the control group, $p = 0.027$. The average number of respondents who had a score 2 at the end of the study in the test Group B was 83.1%, in the test Group A 73.8%, and in the control group 60% of the respondents. By analyzing the results obtained after all three measurements, which refer to the rotation of the subjects by 360°, we found that the respondents of the test Group B at the end of the study had statistically significantly better rotation of 360° than the respondents of the test Group A and the control group, $p = 0.039$. The average number of respondents with a score 2 at the end of the study in the test Group B was 55.4%, in the test Group A 38.5%, and in the control group 45.4% of the respondents (Table 2).

By analyzing the results related to the examination of the initial gait, we obtained data that the respondents from the test Groups A and B after the third test had a statistically significantly better initial gait than the subjects of the

TABLE 1. Comparison of the balance elements values through three measurements in relation to the examined groups - POMA B (Part I)

Score	Control group			Test Group A			Test Group B			*p*
	0	1	2	0	1	2	0	1	2	
Balance in sitting position *n* (%)	10 (7.7)*	20 (15.4)*	100 (76.9)*	1 (1.5)*	8 (12.3)*	56 (86.9)*	-	3 (4.6)*	62 (95.4)*	
	10 (7.7)**	20 (15.4)**	100 (76.9)**	1 (1.5)**	8 (12.3)**	56 (86.9)**	-	3 (4.6)**	62 (95.4)**	0.019
	3 (2.3)***	17 (13.1)***	110 (84.6)***	1 (1.5)***	6 (9.2)***	58 (89.2)***	-	3 (4.6)***	62 (95.4)***	
Getting up from a chair *n* (%)	3 (2.3)*	54 (41.5))*	73 (56.2)*	-	35 (53.8)*	30 (46.2)*	-	38 (58.5)*	27 (41.5)*	
	3 (2.3)**	54 (41.5)**	73 (56.2)**	-	35 (53.8)**	30 (46.2)**	-	38 (58.5)**	27 (41.5)**	0.015
	72 (55.4)***	3 (2.3)***	55 (42.3)***	-	72 (55.4)***	35 (53.8)***	-	30 (46.2)***	30 (46.2)***	
Sitting down on a chair *n* (%)	6 (4.6)*	54 (41.5)*	70 (53.8)*	-	25 (38.5)*	40 (61.5)*	-	23 (35.4)*	42 (64.6)*	
	5 (3.8)**	44 (33.8)**	81 (62.3)**	-	25 (38.5)**	40 (61.5)**	-	20 (30.8)**	45 (69.2)**	0.047
	5 (3.8)***	44 (33.8)***	81 (62.3)***	-	25 (38.5)***	40 (61.5)***	-	20 (30.8)***	45 (69.2)***	
Push (light pressure on the subject's sternum	6 (4.6)*	79 (60.8)*	45 (34.6)*	5 (7.7)*	37 (56.9)*	23 (35.4)*	7 (10.8)*	39 (60.0)*	19 (29.2)*	
while standing with feet close together) n (%)	12 (9.2)**	70 (53.8)**	48 (36.9)**	7 (10.8)**	37 (56.9)**	21 (32.3)**	6 (9.2)**	36 (55.4)**	23 (35.4)**	0.311
	12 (9.2)***	70 (53.8)***	48 (36.9)***	7 (10.8)***	37 (56.9)***	21 (32.3)***	6 (9.2)***	36 (55.4)***	23 (35.4)***	

*First survey, **Second survey, ***Third survey. POMA: Performance-oriented mobility assessment

control group, $p = 0.039$. The average number of subjects who had a maximum score 1 at the end of the study in the test Group B was 100%, in the test Group A 95.4%, and in the control group a maximum score of 1 had 90% of respondents ($p = 0.039$). The results obtained during the gait assessment at the end of the third test, which refer to the continuity of steps, which indicate that the subjects of the test Group B had a statistically significantly better continuity of steps than the subjects of other test groups, $p = 0.033$. The average number of respondents who had a maximum score of 1 for continuity of steps at the end of the study, in the test Group B was 100%, in the test Group A 90.8%, and in the control group 80% ($p = 0.033$). The results related to the examination of torso oscillations during gait indicate that the respondents of the control group had statistically significantly more oscillations of the torso during gait compared to the respondents of both test groups, $p = 0.019$. The average number of respondents who had a minimum score of 0 at the end of the study, which indicates an obvious oscillation of the body was 40.8% in the control group, 35.4%, in the test Group A and 26.2% of the respondents in the test Group B ($p = 0.019$) (Table 3).

When estimating gait after all three measurements, we obtained data related to the height of the steps of the left and right leg, based on which we see that after the third measurement there was no statistically significant difference in the height of the steps of the left and right legs between respondents from different groups, $p = 0.711$ for the step height of the left foot and $p = 0.682$ for the step height of the right foot. The average number of the respondents, who had a maximum score 1 for the step height of the left foot at the end of the study, was 87.7% in the control group and in 86.2% the test Groups A and B ($p = 0.711$), while the average number of respondents who had a maximum score 1 for the step height of the right foot at the end of the study was in 90.08%, the control group and 87.7% in test Groups A and B ($p = 0.682$). There was no statistically significant difference in the height of the left leg step in relation to the respondents of the test groups, $p = 0.711$, in the height of the right leg step in relation to the respondents of the test groups, $p = 0.682$. The results related to the examination of the step width during gait, which indicate that the respondents of the control group had a statistically significantly wider step during gait compared to the respondents of both test groups, $p = 0.028$. The average number of respondents who had a maximum score of 1 for the step width during gait at the end of the study in the test Group B was 43.1%, in the test Group A 33.8%, and in the control group only 19.2% of the respondents ($p = 0.028$) (Table 4).

TABLE 2. Comparison of the balance elements values through three measurements in relation to the examined groups - POMA B (Part II)

Score	Control group			Test Group A			Test Group B			*p*
	0	1	2	0	1	2	0	1	2	
Initial balance in the	10 (7.7)*	88 (67.7)*	32 (24.6)*	3 (4.6)*	46 (70.8)*	16 (24.6)*	-	57 (87.7)*	8 (12.3)*	
standing position (first	10 (7.7)**	88 (67.7)**	32 (24.6)**	3 (4.6)**	46 (70.8)**	16 (24.6)**	-	57 (87.7)**	8 (12.3)**	0.019
5 s) *n* (%)	35 (53.8)***	4 (3.1)***	88 (67.7)***	38 (29.2)***	2 (3.1)***	46 (70.8)***	1 (1.5)***	17 (26.2)***	47 (72.3)***	
Balance in	7 (5.4)*	78 (60.0)*	45 (34.6)*	3 (4.6)*	12 (18.5)*	50 (76.9)*	-	17 (26.2)*	48 (73.8)*	
standing position	7 (5.4)**	78 (60.0)**	45 (34.6)**	3 (4.6)**	12 (18.5)**	50 (76.9)**	-	17 (26.2)**	48 (73.8)**	0.027
(after 5 s) *n* (%)	5 (3.8)***	47 (36.2)***	78 (60.0)***	3 (4.6)***	14 (21.5)***	48 (73.8)***	-	11 (16.9)***	54 (83.1)***	
Balance in standing	7 (5.4)*	74 (56.9)*	49 (37.7)*	4 (6.2)*	35 (53.8)*	26 (40.0)*	1 (1.5)*	45 (69.2)*	19 (29.2)*	
position with eyes	7 (5.4)**	75 (57.7)**	48 (36.9)**	4 (6.2)**	38 (58.5)**	23 (35.4)**	1 (1.5)**	38 (58.5)**	26 (40.0)**	0.027
closed and feet	7 (5.4)***	75 (57.7)***	48 (36.9)***	4 (6.2)***	38 (58.5)***	23 (35.4)***	1 (1.5)***	38 (58.5)***	26 (40.0)***	
together *n* (%)										
Rotation of 360° *n* (%)	6 (4.6)*	81 (62.3)*	43 (33.1)*	-	30 (46.2)*	35 (53.8)*	-	34 (52.3)*	31 (47.7)*	
	5 (3.8)**	66 (50.8)**	59 (45.4)**	-	40 (61.5)**	25 (38.5)**	-	29 (44.6)**	36 (55.4)**	0.039
	5 (3.8)***	66 (50.8)***	59 (45.4)***	-	40 (61.5)***	25 (38.5)***	-	29 (44.6)***	36 (55.4)***	

*First survey, **Second survey, ***Third survey. POMA: Performance-oriented mobility assessment

TABLE 3. Comparison of the gait elements values through three measurements in relation to the examined groups - POMA G (Part I)

Score	Control group		Test Group A		Test Group B		*p*
	0	1	0	1	0	1	
Gait at the beginning *n* (%)	30 (23.1)*	100 (76.9)*	4 (6.2)*	61 (93.8)*	-	65 (100.0)*	0.039
	30 (23.1)**	100 (76.9)**	4 (6.2)**	61 (93.8)**	-	65 (100.0)**	
	13 (10.0)***	117 (90.0)***	3 (4.6)***	62 (95.4)***	-	65 (100.0)***	
Step symmetry *n* (%)	20 (15.4)*	110 (84.6)*	11 (16.9)*	54 (83.1)*	20 (30.8)*	45 (69.2)*	0.039
	20 (15.4)**	110 (84.6)**	11 (16.9)**	54 (83.1)**	20 (30.8)**	45 (69.2)**	
	37 (28.5)***	93 (71.5)***	14 (21.5)***	51 (78.5)***	13 (20.0)***	52 (80.0)***	
Continuity of steps *n* (%)	30 (23.1)*	100 (76.9)*	4 (6.2)*	61 (93.8)*	-	65 (100.0)*	0.033
	30 (23.1)**	100 (76.9)**	4 (6.2)**	61 (93.8)**	-	65 (100.0)**	
	26 (20.0)***	104 (80.0)***	6 (9.2)***	59 (90.8)***	-	65 (100.0)***	
Body oscillation *n* (%)	61 (46.9)*	69 (53.1)*	19 (29.2)*	46 (70.8)*	23 (35.4)*	42 (64.6)*	0.019
	53 (40.8)**	77 (59.2)**	23 (35.4)**	42 (64.6)**	17 (26.2)**	48 (73.8)**	
	53 (40.8)***	77 (59.2)***	23 (35.4)***	42 (64.6)***	17 (26.2)***	48 (73.8)***	
Turning while walking *n* (%)	69 (53.1)*	61 (46.9)*	21 (32.3)*	44 (67.7)*	23 (35.4)*	42 (64.6)*	0.611
	69 (53.1)**	61 (46.9)**	21 (32.3)**	44 (67.7)**	23 (35.4)**	42 (64.6)**	
	52 (40.4)***	78 (60.0)***	25 (38.5)***	40 (61.5)***	22 (33.8)***	43 (66.2)***	

*First survey, **Second survey, ***Third survey. POMA: Performance-oriented mobility assessment

TABLE 4. Comparison of the gait elements values through three measurements in relation to the examined groups - POMA G (Part I)

Score	Control group		Test Group A		Test Group B		*p*
	0	1	0	1	0	1	
Step height - left leg *n* (%)	3 (2.3)*	127 (97.7)*	7 (10.8)*	58 (89.2)*	11 (16.9)*	54 (83.1)*	0.711
	3 (2.3)**	127 (97.7)**	7 (10.8)**	58 (89.2)**	11 (16.9)**	54 (83.1)**	
	16 (12.3)***	114 (87.7)***	9 (13.8)***	56 (86.2)***	9 (13.8)***	56 (83.1)***	
Step height - right leg *n* (%)	6 (4.6)*	124 (95.4)*	6 (9.2)*	59 (90.8)*	10 (15.4)*	55 (84.6)*	0.682
	6 (4.6)**	124 (95.4)**	6 (9.2)**	59 (90.8)**	10 (15.4)**	55 (84.6)**	
	12 (9.2)***	118 (90.8)***	8 (12.3)***	57 (87.7)***	8 (12.3)***	57 (87.7)***	
Step length - left leg *n* (%)	9 (6.9)*	121 (93.1)*	1 (1.5)*	64 (98.5)*	-	65 (100.0)*	0.511
	9 (6.9)**	129 (93.1)**	1 (1.5)**	64 (98.5)**	-	65 (100.0)**	
	9 (6.9)***	129 (93.1)***	1 (1.5)***	64 (98.5)***	-	65 (100.0)***	
Step length - right leg *n* (%)	6 (4.6)*	124 (95.4)*	-	65 (100.0)*	1 (1.5)*	64 (98.5)*	0.789
	6 (4.6)**	124 (95.4)**	-	65 (100.0)**	1 (1.5)**	64 (98.5)**	
	10 (7.7)***	120 (92.3)***	-	65 (100.0)***	1 (1.5)***	64 (98.5)***	
Step width *n* (%)	130 (100.0)*	-	44 (67.7)*	21 (32.3)*	38 (58.5)*	27 (41.5)*	0.028
	105 (80.8)**	25 (19.2)**	25 (19.2)**	43 (66.2)**	22 (33.8)**	37 (56.9)**	
	105 (80.8)***	25 (19.2)***	43 (66.2)***	22 (33.8)***	37 (56.9)***	28 (43.1)***	

*First survey, **Second survey, ***Third survey. POMA: Performance-oriented mobility assessment

Applying the ANOVA test to gait analysis as part of the POMA G test, it was found that there was no statistically significant difference in the average values in the first measurement. After the second measurement, the respondents of the test group had statistically significantly better values of gait analysis. There was a statistically significant improvement in gait of the test group after the third measurement compared to the control group, $p = 0.017$ (Table 5).

TABLE 5. Comparison of gait values during the first and third measurements

Testing	N	X	SD	SEM	Minimum	Maximum	*p*
First							
Control	130	9.01	2.44	0.15	0.00	12.00	
Test A	65	8.93	2.43	0.15	0.00	12.00	0.429
Test B	65	9.09	2.40	0.15	0.00	12.00	
Third							
Control	130	8.67	2.61	0.23	0.00	12.00	
Test A	65	9.30	2.03	0.26	5.00	12.00	0.017
Test B	65	9.71	2.15	0.27	1.00	12.00	

DISCUSSION

We studied the effects of moderate-intensity therapeutic exercise with Theraband strips (Group A) and the effects of therapeutic antigravity exercise (Group B) for 6 months, on balance and gait in people over 65, and compared them with the control group that did not have a programmed therapeutic exercise. By assessing the degree of balance using the POMA B scale, it was found that there was no statistically significant difference in the degree of balance between the groups that conducted programmed therapeutic exercise. The average values of the POMA B test of Group A were 13.02, and of Group B 13.42, and they were statistically significantly different from the control group whose test value was 11.82 ($p = 0.038$).

The highest average values of gait analysis had the respondents of the Group B (POMA G = 9.71) and it was statistically significantly better compared to the respondents of the control group (POMA G = 8.67), $p = 0.017$, but did not differ statistically significant from the examined Group A (POMA G = 9.30).

A detailed statistical analysis of the POMA T-test showed that the greatest improvement was in the respondents of the examined B group who performed therapeutic antigravity exercises. The average value of POMA T for the Group B was 21 at the beginning of the study and 23.13 at the end, which is an increase of 2.13, which was statistically significant compared to the control group. The average value of POMA T in the respondents of the Group A who performed therapeutic strengthening exercises of moderate intensity with Theraband strips increased by 0.43, and the control group by 0.41, which has no statistical significance (Table 6).

TABLE 6. Average values of POMA through three measurements in relation to the examined groups

	Control group	Test Group A	Test Group B	*p*
POMA B	11.07*	11.95*	11.91*	0.017
	11.70**	11.78**	12.58**	
	11.82***	13.01***	13.42***	
POMA G	9.01*	8.93*	9.04*	0.038
	8.39**	9.56**	9.40**	
	8.67***	9.30***	9.71***	
POMA T	20.08*	20.88*	21.00*	0.037
	20.09**	21.34**	21.98**	
	20.49***	21.31***	23.13***	

*First survey, **Second survey, ***Third survey. POMA: Performance-oriented mobility assessment

The analysis of the gender structure of the respondents in the control and test groups showed that there were more female respondents in the test group than in the control group, in which male respondents were more represented. The average age of the respondents in the test groups did not differ statistically significantly. In their 12-week study, Yamauchi et al. demonstrated the impact of therapeutic exercise on muscle strength, balance, mobility, and stamina in the persons of third age of life. The study included 40 respondents who were divided into two groups. The experimental group included 23 subjects who performed therapeutic exercises 3 times a week for 90 min. The exercises consisted of aerobic exercises, moderate exercises with Theraband strips, and stretching exercises. The control group consisted of 17 subjects who were not involved in therapeutic exercise. After the study, results obtained

showed significant progress in the experimental group, where the balance improved statistically significantly, while in the control group, it worsened (12).

In their study, Hasegawa et al. examined the effects of elastic band exercise on upper and lower extremity muscle strength, and on functional mobility in people over 65 years of age. The study included 52 subjects and lasted for 9 weeks. Subjects performed exercises for 3 weeks which consisted of 15-min warm-up exercises, 60-min moderate load exercises with elastic bands, and 15-min stretching and cooling exercises. At the beginning and end of the study, they conducted three tests, two of which related to the assessment of muscle strength performance for the upper and lower extremities and one test to assess functional mobility. To assess the performance of upper extremity muscle strength, they used the number of repetitions of flexion in the elbow with moderate load for 30 s, and to assess the performance of lower extremity muscle strength, they used a test, in which the subjects were tested in how many times the they can stand up from a chair and sit down in a chair in 30 s, this test was also used to assess balance performance. They used the time up and go test to assess functional mobility. After a 9-week study, they obtained results based on which they noticed that there was a significant improvement in balance by 24.9% (7). The results of this study showed remarkable improvement, which indicates the efficiency of elastic bands. Furthermore, a statistically significant improvement was recorded in our study, in the group that used Theraband tapes, but in a far smaller proportion. The big difference in the success rate of these two studies is that they used different tests to valorize the balance state.

Judge et al. in their quarterly randomized clinical trial on 110 subjects with an average age of 80 years in the United States evaluated the success of therapeutic strengthening exercises with elastic bands in relation to subjects who performed therapeutic exercises to improve balance and subjects who were not included in therapeutic exercise. After the research, it was stated that the success of the treatment in the group, where elastic bands were used was significantly better in terms of improving balance (13).

Numerous authors have analyzed the effectiveness of therapeutic exercise with elastic bands on gait of the persons in the third age of life and pointed out significantly positive effects. According to the available literature, we could not find works that in the same or similar way as we valorized the state of gait, because other authors relied on much simpler tests, which do not require much time to perform, and which are easier to process. Thus, Oesen et al. in their randomized study proved that in people in the third age of life, tests of maximum gait speed, and distance travelled within 6 min significantly improved after 6 months of exercise with elastic bands, twice a week (14). Ahn and Kim in the 5-month study included people in the third age of life who have Alzheimer's disease. The therapeutic program included the use of elastic bands 3 times a week. After conducting research, they demonstrated a significant improvement in results when performing a 2-min gait test (15).

CONCLUSION

Both strengthening and antigravity therapeutic exercises improve the level of physical fitness in older adults, although therapeutic antigravity exercises had a better impact on the level of physical activity.

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DECLARATION OF INTERESTS

There are no conflicts of interest to declare by any of the authors of this study.

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