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NORDIC WALKING TRAINING AND PHYSICAL FITNESS IN ELDERLY WOMEN

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Abstract

Introduction. Together with longer human lives, increase in economy level and higher social expectations, there is also need for developing science studies on physical culture and its role in prevention of ageing. Taking care of physical fitness is one of the main factor that guarantees both health and high quality life for millions of older people. The purpose of this article was to determine the changes of physical fitness level under the influence of Nordic walking trainingin women aged 60-75 years. ***Material and methods***. 65 women aged 60-75 years were the subject of this study. Women were divided into 2 groups: control group (26 people) and experimental group (39 people). Women from experimental group were taking part in Nordic walking training for 15 weeks, 2 times a week, 60 minutes each meeting. To determine the level of physical fitness some trials from EUROFIT test for adults were applied and march test 2 km was held. ***Results***. The trend of improvement of physical fitness under health education and Nordic walking training was determined. The best results was on endurance field (statistically significant $p<0.05$). It was also observed slight decrease in physical fitness in women that didn't take part in mentioned training.

Key words: women aged 60-75, endurance, strength, flexibility, Nordic walking training

Introduction

Gradual increase in average life span is predicted to cause a rapid population aging process within the next twenty odd years[1].

Government reports inform that the state of average health condition and leisure time budget of the elderly call for initiatives encompassing health services including education and treatment. Therefore it would seem there is an urgent need for development of social services, related directly and indirectly with health, such as: sport, tourism and recreation. Activities promoting health prevention and social prevention should also be intensified [2]. Sustaining population's health potential by caring for – among other things – their physical fitness should be a strict priority. Good physical fitness is a necessary condition for keeping everyday self-reliance which in turn allows for independence till a ripe old age.

In the literature on the subject we can find numerous studies devoted to measuring the influence of physical activity on sustaining or improving cognitive functions, early insufficiency prevention, decreasing diseases incidence rate, as well as increasing life span and its quality. Yet the quest for effective propositions to encourage participation in physical activities is still underway almost all over the world [3, 4]. Various programmes in favor of physical activity, promoting healthy lifestyle and aimed mainly at middle aged and elderly people, all contribute to this ongoing endeavour [5, 6, 7].

Rapid population aging is the cause of growing demand for trendy and efficient forms of health training. One of these forms is Nordic walking training which is presently becoming one of the most dynamically spreading forms of physical activity.

Growing interest in Nordic walking is also evident in academic circles. Various research projects being presently conducted focus mainly on determining the influence of Nordic walking training on a process of complex rehabilitation and motor recreation [8, 9, 10, 11, 12].

The aim of this study was to evaluate changes in physical fitness level of women aged between 60-75 under the influence of Nordic walking training.

Material and methods

The research was conducted within a time stretch extending from February to May 2012 with participation of 65 women aged between 60-75 – all of them residing in Gdańsk. The women were divided into two groups. First group consisted of 26 ladies (referred to as a 'control group') who did not participate in physical activities. Women who constituted a second group (called a 'training group' or 'non-training group') – which consisted of 39 ladies – took part in Nordic walking trainings throughout the 15 weeks period. The trainings were held twice a week and lasted 60 minutes each. Tests of the both research groups were taken twice with the interval of 15 weeks. For the purpose of this research paper the primary tests are referred to as 'tests no.1' and the final ones – 'tests no.2'.

Table 1 presents characteristics of the control group and the training group.

Table 1. Mean values and (standard deviation) of demographic and body composition data

Variables	Control group (n_1 = 26)	Training group (n_2 = 39)
Age	68.7 (5.0)	67.7 (5.6)
BMI	27.4 (4.4)	26.7 (3.5)
BFM [%]	34.7 (6.7)	34.2 (6.7)
FFM [kg]	46.1 (7.3)	45.4 (4.3)
TBW [kg]	33.7 (5.4)	33.5 (3.2)

Every training unit (single Nordic walking training) consisted of three stages. The preliminary stage (lasting for about 10 minutes) was devoted to warm-up exercises with the use of Nordic walking poles. The main stage (lasting for about 45 minutes) was devoted to walking with poles on a distance between 3.5-4.5 km with intensity of 60%. Walking intensity was controlled with the use of Polar Team heart rate monitors. The last stage of the training (lasting for about 5 minutes) was devoted to stretching exercises with the use of poles.

All persons participating in the experiment underwent obligatory medical examination procedure to ensure there were no contraindications against recreational physical effort. The participants were informed about the purpose of the study and they voluntarily consented to take part in it.

To evaluate level of participants' physical fitness two tests from EUROFIT multi-stage test for adults were used: 'sit-up' (according to procedure this test was not timed) and 'sit-and-reach' test [13]. Additionally a 'Cooper walking test' on a distance of 2 km was used [14]. The tests were conducted in the physical effort lab of AWFiS (Gdańsk University of Physical Education and Sport) and on the athletics running track. All the tests strictly followed current methodological procedures and were done in accordance with the rules of physical fitness assessment. Collected data was then analysed using basic statistical measures with the help of computer program Statistica 10.

Results

The characteristic of endurance in women under Nordic walking training and women from control group is presented in table 2.

Table 2. Comparison of endurance levels in women from training group and in women from control group – test no.1 and test no.2

Group	n	2 km walk test [s]								
		Test no.1			Test no.1			Difference		
		X	SD	V%	X	SD	V%	X	%	z
Training	39	1165,9	102,8	8,81	1116,8	104,7	9,37	-49,1	4,21	3,63*
Control	25	1229	168,9	13,7	1282,1	193,2	15	55,1	4,48	1,51

* – statistically significant score at $p<0.05$.

Analysis of the data shown in the table above indicates a very high result directly concerning the effectiveness of the pedagogical experiment conducted in the form of the said training. Values of Student's t-distribution confirmed an increase in endurance level of training group. Women between 60-75 years old improved their 2 km walking test results by 4.21%. The endurance increase showed statistical significance of $p<0.05$. A stable value of variability factor between 8.81-9.37% was also observed. The collected results indicate high efficiency of Nordic walking training in improving endurance level of women between 60-75 years of age.

The average result of walking test among members of the control group in the primary test was 1229 seconds (i.e. 20.48 minutes) with the average variability factor of 13.7%. In the final test the average result was 1282.1 seconds (i.e. 21,36 minutes) with the variability factor of 15%. The results shown in the corresponding table indicate that among the non-training persons there occurred a decrease of endurance amounting to 4.48%.

Detailed analysis of the endurance in women taking part in training and in women with no training is shown in table 3 and illustrated in figures 1 and 2.

Table 3. Analysis of the difference in 2 km walk test results divided into training and control group [s]

The difference of the test results	Unit	Training group	Control group
the higher score	quantity	30	10
the lower score	quantity	8	15
unchanged	quantity	1	0
the average increase of the result	%	6.9	9.4
the average decrease of the result	%	-6.4	-15.5
the minimum difference	%	-13.9	-51.9
the maximum difference	%	18.6	16

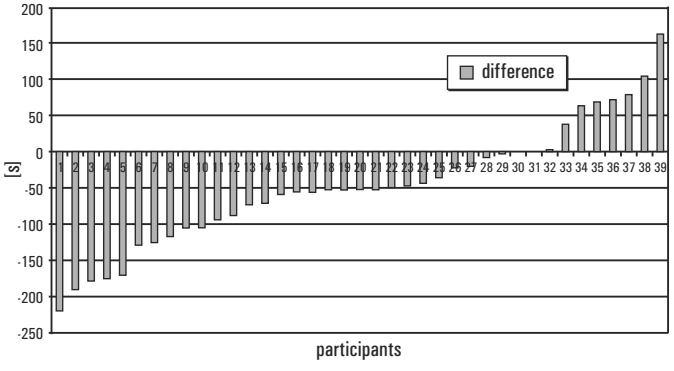

Figure 1. Individual differences in the results obtained at 2 km walk test in women from the training group

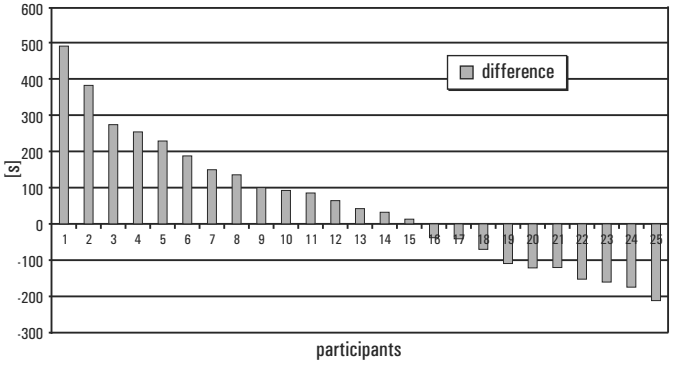

Figure 2. Individual differences in the results obtained at 2 km walk test in women from the non-training group

Another motor skill under scrutiny during the training process was muscle strength. Sufficient muscle strength allows for full and effective participation in organized and controlled physical activities. It constitutes an important factor conducive to leading a healthy lifestyle and improving one's motor abilities.

The characteristics of abdominal muscle strength in women from training group and in women from control group, both aged 60-75 is presented in table 4

Table 4. Comparison of muscle strength level between women from training group and women from control group – test no.1 and test no.2

Group	n	'sit-up' test (number of repetitions)								
		Test no.1			Test no.1			Difference		
		X	SD	V%	X	SD	V%	X	%	Z
Training	39	9.34	4.87	52.14	10.67	4.5	42.17	1.33	14.24	1.19
Control	25	8.6	4.8	55.8	8.4	3.84	45.7	-0.2	2.3	0.25

Our data in the table above indicates that women partaking in the trainings improved their abdominal muscles strength by 14.24% on average. Wide divergence between the individual results was the cause of high variability factor which amounted to 52.14% in the primary test and 42.17% in the final one.

Individual differences in the results obtained in 'sit–and-reach' test in the Nordic walking group, are presented in table 5 and figure below.

Table 5. Analysis of the differences in the test results of abdominal muscle strength divided into training and control group [reps]

The difference of the test results	Unit	Training group	Control group
the higher score	quantity	14	5
the lower score	quantity	10	7
unchanged	quantity	15	13
the average increase of the result	%	15.4	103.1
the average decrease of the result	%	-38.1	-32.4
the minimum difference	%	-66.7	-66.7
the maximum difference	%	350	200

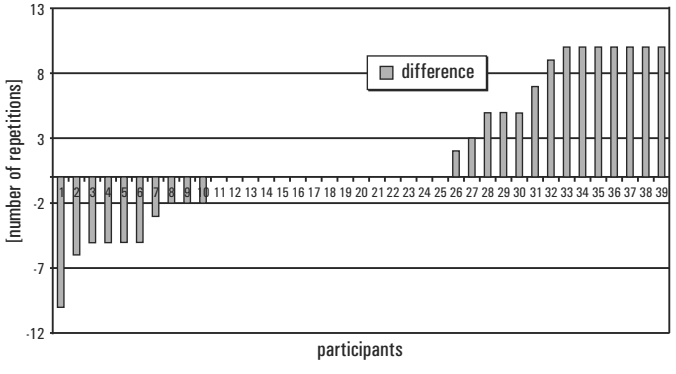

Figure 3. Individual differences in the results obtained in an 'sit-up' test in women from the experimental group

Within the non-training group there occurred a slight decrease in the strength results. The average values of the test were lower than 2.3%. Differences manifested also in variability factor values which – similarly as in the training group – dropped, making control group more homogenous in terms of abdominal muscles strength variable.

Individual differences in the results obtained in 'sit–and-reach' test in non active women, are shown in table 5 and illustrated in figure 4.

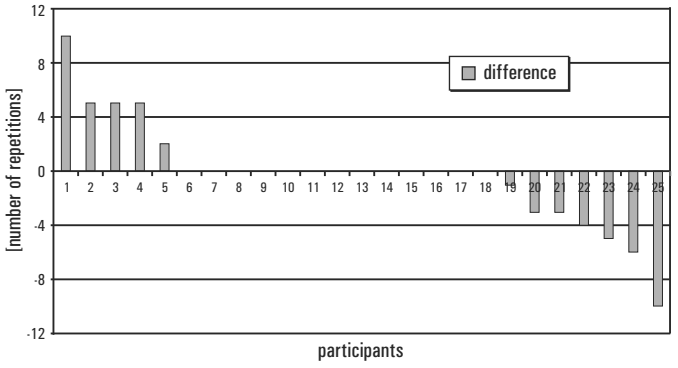

Figure 4. Individual differences in the results obtained in a 'sit-up' test women from the control group

Subsequent part of the present paper presents results concerning influence of Nordic walking training on flexibility levels.

Among people in advanced age there are indications of significant changes in flexibility level as a result of involution processes. These changes might – in extreme cases – be a cause of severe immobilization.

The changes of flexibility in a experimental group and control group are shown in table 6.

Table 6. The data about flexibility level in women from experimental group and women from control group – initial and final study

Group	n	'sit-and-reach' test [cm]								
		Test no.1			Test no.1			Difference		
		X	SD	V%	X	SD	V%	X	%	t
Training	39	34.58	8.76	25.33	35.95	7.40	20.58	1.37	3.96	1.93
Control	26	34.9	6.8	19.5	34.4	8.1	23.5	-0.53	1.52	0.51

Women partaking in the Nordic walking training improved their flexibility by 3.96% on average. The average value of 'sit-and-reach' as part of the primary test was 34.58 centimeters and in the final test amounted to 35.95 centimeters. Variability factor value dropped from 25.33% to 20.58% in the final test.

Among non-training women the average value of flexibility level in primary test was 34.9 centimeters with the average variability factor of 19.5%. In the final test the average result was 34.4 centimeters with the variability factor of 23.5%. The results presented in the table 6 indicate that within 15 weeks time there occurred a 1.52% decrease in flexibility among non-training participants.

Detailed analysis of the flexibility changes in training and non-training group is presented in table 7. Individual changes in the flexibility level of the women taking part in training are depicted graphically in figures 5 and 6.

Table 7. Analysis of the test results of 'sit-and-reach' test divided into training and control group [cm]

The difference of the test results	Unit	Training group	Control group
the higher score	quantity	23	12
the lower score	quantity	14	11
unchanged	quantity	2	3
the average increase of the result	%	17.6	11.9
the mean decrease of the result	%	-7.7	-16.1
the average increase of the result	%	-21.3	-35.7
the average decrease of the result	%	114.3	41.1

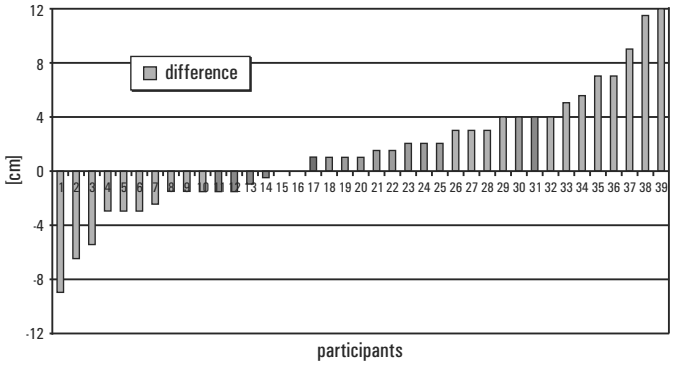

Figure 5. Individual differences in the results obtained in a 'sit-and-reach' test in women from the training group

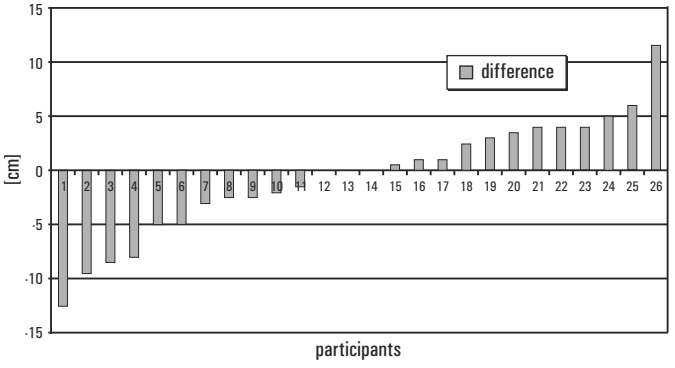

Figure 6. Individual differences in the results obtained in a 'sit-and-reach' test in women from the non-training group

Discussion

Importance of motor activity for proper functioning of human body increases with the passage of time. Physical activity plays a crucial role in gerontological prevention and poses one of the significant conditions for a serene old age [15].

However, data published in Eurobarometer indicate that frequency of focused physical activity decreases with age. Most of respondents between 15-24 years of age (60%) go in for it at least once a week. Among people aged between 25-39 this percentage drops to 44%, in the age range of 40-54 – to 40%, in the age range of 55-69 – to 33%, and finally among people aged 70+ it dwindles to 22% [16]. Structure of daily time budget of Polish citizens surveyed in 2003-2004 – in various age groups – showed that people over 65 years old devote only 1.7% of their daily time for sport and recreation in general [2].

Numerous research papers emphasize the point that endurance, muscle strength and flexibility, in addition to well functioning body balance system, are of the utmost importance for physical fitness and functional self-reliance of the elderly [14, 15].

Furthermore, the research study showed statistically relevant improvement in endurance levels and a tendency to increase abdominal muscles strength and flexibility of the lumbar spinal region among participating women.

Church et al. (2002) observed an increased oxygen consumption under the influence of Nordic walking training. The study was conducted with participation of 11 women (M=27.1 years, SD=6.4) and 11 men (M=33.8 years, SD=9.0). In the women group the oxygen consumption increase was reported as: M=14.9 ml x kg(-1) x min(-1), SD=3.2 vs. M=17.9 ml x kg(-1) x min(-1), SD=3.5, $p<0.001$. Scientists suggest that Nordic walking training allows for increase in aerobic endurance of up to 20% on average. This percentage can be raised depending on the intensity of the training. It is particularly important for people wanting to burn more calories and suffering from specific health problems [18]. Another study conducted within a group of 32 healthy men and women indicated that Nordic walking training led to oxygen consumption increase of 23% on average, cardiac cycle frequency rise of 16% and heightened energy expenditure (22%) – in comparison with persons training walks without poles [19]. Scientists also proved that regular Nordic walking trainings for women (lasting between 8-13 weeks) lead to increased levels of high-density lipoproteins and decreased levels of total cholesterol, low-density lipoproteins, triglycerides and BMI [20].

Nordic walking training can also be effective in shaping the strength of lower and upper limbs. The study documenting this claim was conducted at AWFiS in Gdańsk within a group of 31 women aged between 60-69. They participated in a pedagogical experiment devised to evaluate the influence of two types of healthful training: general fitness and Nordic walking. The results indicated that – in comparison with general fitness training – Nordic walking training shows higher efficiency in improving arms and legs strength levels among women of 60-69 years of age. The women partaking in Nordic walking training increased their results moving up the scale from 80 to 95 centile [21]. Results displayed in the present paper indicate that Nordic walking training can be also efficient in shaping the abdominal muscles strength in women over the age of 60.

Harvinster et al. (2010) conducted a study which analysed effects of Nordic walking training on participants suffering from sacrum pains. The researchers proved that Nordic walking training is a suitable activity for people suffering from such a condition [22]. A research study conducted in Kaunas with participation of 41 volunteers (11 men and 30 women aged 65 +- 5 years) indicated a positive influence of Nordic walking training on flexibility of the lumbar spinal region. The improvement amounted to 2.64 centimeters while in the control group the result decreased by 0.81 centimeters [23]. In our present study the average increase amounted to a slightly lower factor of 1.37 centimeters, while the control group showed a decrease of 0.53 centimeters in torso flexibility. The differences between flexibility increase results obtained by us and the scientists from Kaunas could be related to a number and kind of flexibility exercises performed by participants during warm-up and final parts of the Nordic walking training.

In search of effective means of promoting physical activity it is advisable to take heed of the guidelines concerning activities programming published by WHO, which state that: "while physically active lifestyle is possible without taking part in any formal exercise programme, although in many industrialized societies the only chance of maintaining physical activity is through organized activity programmes".

Keeping the above suggestions in mind there are huge efforts currently underway to work out efficient training programmes aimed at maintaining or improvement of previously mentioned motor skills.

The research conducted in the present study shows that one of such solutions could be Nordic walking training. The results of the above analyses predominantly indicate that a suggested training load could constitute an effective factor in shaping endurance, strength and flexibility among women within the covered age range.

Conclusions

1. The study revealed that there occurs a statistically relevant improvement in endurance level among women

aged between 60-75 as a result of 15 weeks long training macrocycle featuring Nordic walking.
2. To improve training efficiency concerning strength and flexibility it is advised to intersperse Nordic walking training with flexibility and strength focused exercises – stationary and in motion – with the use of poles.
3. A slight decrease in endurance, strength and flexibility levels was observed with age among physically non-active people.

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