fizjoterapia polska
nr 4/2015 (15)

Nordic walking jako forma aktywności fizycznej wpływająca na chód i równowagę osób starszych

Nordic walking as a form of physical activity affecting gait and balance in elderly people

Agnieszka Leszczyńska[1(A,C,D,F)], Marta Dopierała[2(A,B,C)], Jan W.Raczkowski[1(E,F,G)]

[1]Oddział Kliniczny Rehabilitacji Pourazowej Uniwersytetu Medycznego w Łodzi, Polska/
Post Traumatic Rehabilitation Clinic of the Medical University of Lodz, Poland
[2]Nadwiślański Oddział Straży Granicznej - Placówka Straży Granicznej w Łodzi, Polska/
Nadwislanski Border Guard – Border Guard facility in Lodz, Poland

Streszczenie:
Wstęp. W procesie starzenia dochodzi do pogorszenia sprawności ruchowej, na którą wpływ mają między innymi choroby wieku podeszłego. Zachodzące zmiany patofizjologiczne, stosowane leczenie mogą negatywnie wpływać na sprawność ruchową prowadząc do zaburzenia kontroli stabilności postawy i chodu. Chód jest naturalną formą aktywności fizycznej i bierze udział prawie we wszystkich czynnościach dnia codziennego. Dla podtrzymania aktywności ruchowej, minimalizacji zaburzeń równowagi oraz poprawy chodu zwłaszcza u osób
w podeszłym wieku, coraz częściej stosuje się popularną formę aktywności jaką jest Nordic Walking.
Cel pracy.Głównym celem pracy była ocena wpływu treningu Nordic Walking na poprawę chodu i równowagi osób starszych oraz wpływ treningu na subiektywną ocenę stanu samopoczucia.
Materiał i metody. Badania przeprowadzono w grupie 30 osób starszych, w większości aktywnie spędzających czas wolny, nie korzystających z treningów Nordic Walking. W oparciu o indywidualny kwestionariusz badawczy, ocenie poddane zostały wiek i płeć respondentów, formy aktywności fizycznej, trudności podczas chodzenia oraz subiektywna ocena samopoczucia.
W celu szybkiej oceny równowagi i ryzyka upadków zastosowano Functional Reach Test. Do wstępnej oceny chodu i równowagi pacjenta w starszym wieku posłużono się testem Get up and Go oraz test Tinetti Chód i Równowaga. Testy zostały wykonane zarówno przed treningiem jak i po miesięcznym treningu Nordic Walking. Uzyskane wyniki opracowano statystycznie przy pomocy programu PQSTAT.
Wyniki. Analiza wyników uzyskanych przed treningiem oraz po miesięcznym treningu w testach Functional Reach Test oraz Tinetti wykazała znaczną poprawę po treningach, natomiast uzyskane wartości w teście Get up and Go po treningu są znacznie niższe niż przed treningiem. Stan samopoczucia w subiektywnej ocenie badanych uległ poprawie po wdrożonym treningu Nordic Walking.
Wnioski. Miesięczny trening Nordic Walking istotnie wpłynął na poprawę chodu i równowagi osób badanych. Stan samopoczucia w subiektywnej ocenie badanych również uległ poprawie po wdrożonym treningu. Nordic Walking może stać się ważnym elementem w zwiększeniu aktywności ruchowej osób starszych oraz poprawie ich jakości życia.

Słowa kluczowe:
aktywność fizyczna, Nordic Walking, osoby starsze

Abstract
Introduction. In the process of aging there comes to deterioration in mobility which is related to, among others, age-related diseases. The pathophysiological changes, the applied treatment may adversely affect mobility leading to the disorders of postural stability and gait control. Gait/Walking is a natural form of physical activity and is a component of almost all daily activities. To sustain physical activity, minimize imbalance disorders and to improve gait, particularly in elderly people, Nordic Walking – a popular form of activity – is used more and more frequently.
Aim. The main aim of this study was to evaluate the effect of Nordic Walking training on the improvement of gait and balance in elderly people and its impact on subjective assessment of their well-being.
Material and methods. The study included 30 elderly subjects, most of them actively spending their leisure time, not practising Nordic Walking. Age and sex of the respondents, physical activity, difficulty in walking and subjective assessment of well-being were estimated on the basis of individual research questionnaire. The Functional Reach Test was used for quick evaluation of balance and the risk of falls. Get up and Go test and Tinetii Gait and Balance test were used for preliminary evaluation of gait and balance in elderly patients. The tests were performed both before and a month after Nordic Walking training. The results were statistically analyzed applying the PQStat software.
Results. Analysis of the results obtained before and after 1-month training in Functional Reach and Tinetti tests demonstrated significant improvement after the training, whereas the values obtained in the Get up and Go test after the training were much lower than before the training. A state of well-being in the subjective assessment of the respondents improved after Nordic Walking training.
Conclusions. One-month Nordic Walking training improved significantly gait and balance in the investigated subjects. A state of well-being in the subjective assessment of the respondents also improved after the training. Nordic Walking can become an important element in increasing the physical activity of older people and in improving their quality of life.

Key words:
physical activity, Nordic Walking, elderly people

Introduction

Our life is made up of several stages, and the final one is the old age. In the process of aging there comes, among others, to the deterioration of mobility which is affected by e.g. age-related diseases. The occurring pathophysiological changes, applied treatment can affect mobility significantly reducing it or may lead to balance and gait disorders [1]. Walking is a natural form of physical activity and it participates in almost all daily activities. Physical activity means any form of body movement in which lower limbs, upper limbs and the trunk are involved. To sustain physical activity, minimize imbalance and to improve gait, especially in the elderly – Nordic Walking, a popular form of activity, is more and more frequently practised [2]. Nordic Walking involves walking with poles that have been specially designed for this activity. With poles in hands, the posture becomes more upright. This helps to maintain an optimal center of gravity during walking, which plays an important role in older people who have difficulty in maintaining balance. Walking becomes more efficient [3, 4].

Aim

The main aim of this study was to evaluate the effect of Nordic Walking training on the improvement of gait and balance in elderly people and its impact on subjective assessment of their well-being.

Material and methods

The study was conducted in a group of 30 subjects, aged 56-76 years. Most of the respondents spent their free time actively but they did not practise Nordic Walking. The criterion for inclusion into the study was voluntary consent and the general condition of the patient allowing for participation in the program. Exclusion criterion was poor general health. The respondents' age, sex, physical activity, difficulty in walking and subjective assessment of well-being were analyzed. Functional Reach Test was used for quick assessment of balance and risk of falls. It consists in measuring the maximal distance an individual can reach forward while standing in a fixed position (stabilized pelvis and feet in contact with the ground). This test provides quantitative information about the dynamic ability to maintain balance in a standing position [8]. Get up and Go test was applied to evaluate the gait and functional capacity. It requires patients to perform a particular sequence of movements: stand up from a chair, walk a distance of 3 m, turn around, return and sit down again. The result of the test was the time needed to complete the task without losing balance [9]. The next was Tinetti Gait and Balance test

which evaluated 16 tasks – 9 to allow assessment of balance maintenance while performing different tasks and 7 assessing gait [9]. A state of well-being was assessed on the basis of answers to questions in a 10-point scale, where the values defined: 0 – very bad and 10 – very good. The patients were divided into six groups (5 subjects each) basing on the level of physical fitness and easier control of the correctness of training tasks. Each group fulfilled one month training program every other day.

The training schedule consisted of three stages. The first stage was a 10-minute warm-up to prepare the organism for increased effort.

The second stage was the 30-minute proper training during the first week, gradually increasing to 50 minutes in the fourth week.

The final stage consisted of stretching exercises, breathing exercises – a resting phase of 10 minutes. After a month of the training the Functional Reach Test, Get up and Go and Tinetii Gait and Balance tests were repeated. The results were analyzed statistically using the PQStat software [1].

Results

One of the factors analyzed in the questionnaire was age of subjects who joined the Nordic Walking training which is shown in table 1, figure 1.

Table 1. Structure of age of the investigated subjects

Wiek Age	Liczba Number	%
=< 60	3	10
61-62	6	20
63-64	8	27
65-66	5	17
67-68	3	10
69-70	3	10
<70	2	6

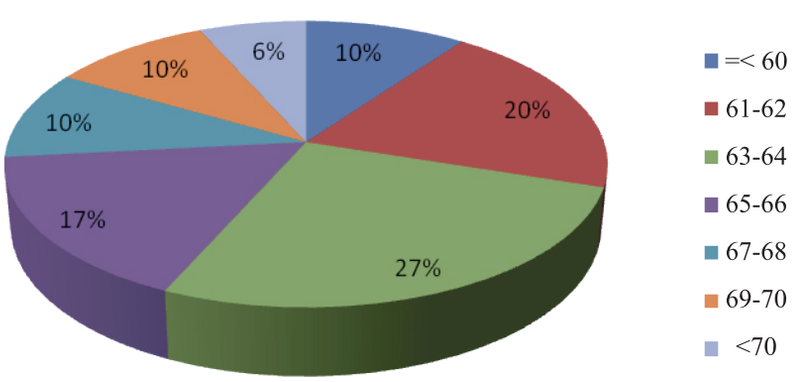

Figure 1. Age of the investigated subjects

The largest age group included subjects aged 63-64 years which represents 27% of the respondents. Two individuals were older than 70 years – 6% of the study group.

The study included 30 subjects, 97% were women, 3% men (fig. 2).

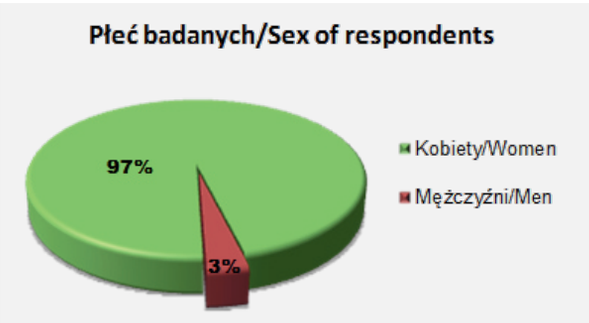

Figure 2. Percentage of women and men taking part in Nordic Walking training

Physical activity of the respondents was one of the key factors analyzed in the questionnaire. Walks were the most often preferred form of physical activity which accounted for 43% of the answers. Gardening and cycling were listed further on which is presented in figure 3.

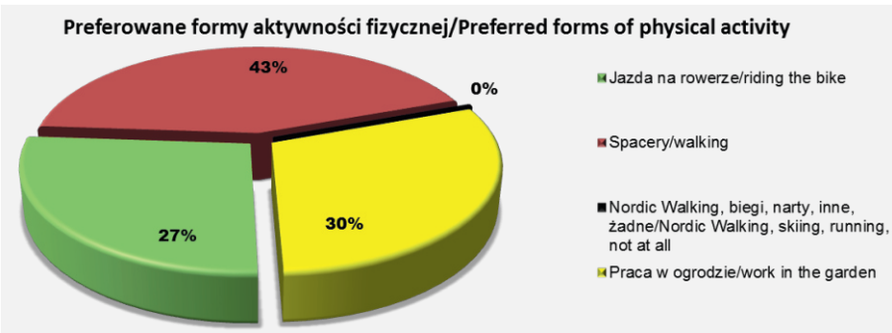

Figure 3. The preferred forms of physical activity

The question whether walking was difficult for the examined was answered negatively by 77% of the respondents (fig. 4).

Figure 4. Difficulty in walking

Using the Wilcoxon signed-rank test, a statistically significant difference was obtained analyzing the results of the tests performed prior to and after the Nordic Walking training. Table 2 demonstrates the relationships.
Graphic presentation of the above correlations between the tests performed before and after completion of the Nordic Walking training is demonstrated in fig. 5.

Table 2. Wilcoxon signed-rank test differentiating the obtained test results

	Test contents	p-value
Functional Reach Test BEFORE & Functional Reach Test – AFTER	4.133013	0.000036
Get up and Go – BEFORE & Get up and Go – AFTER	4.703046	0.000003
Tinetti sum – BEFORE & Tinetti sum – AFTER	4.540725	0.000006

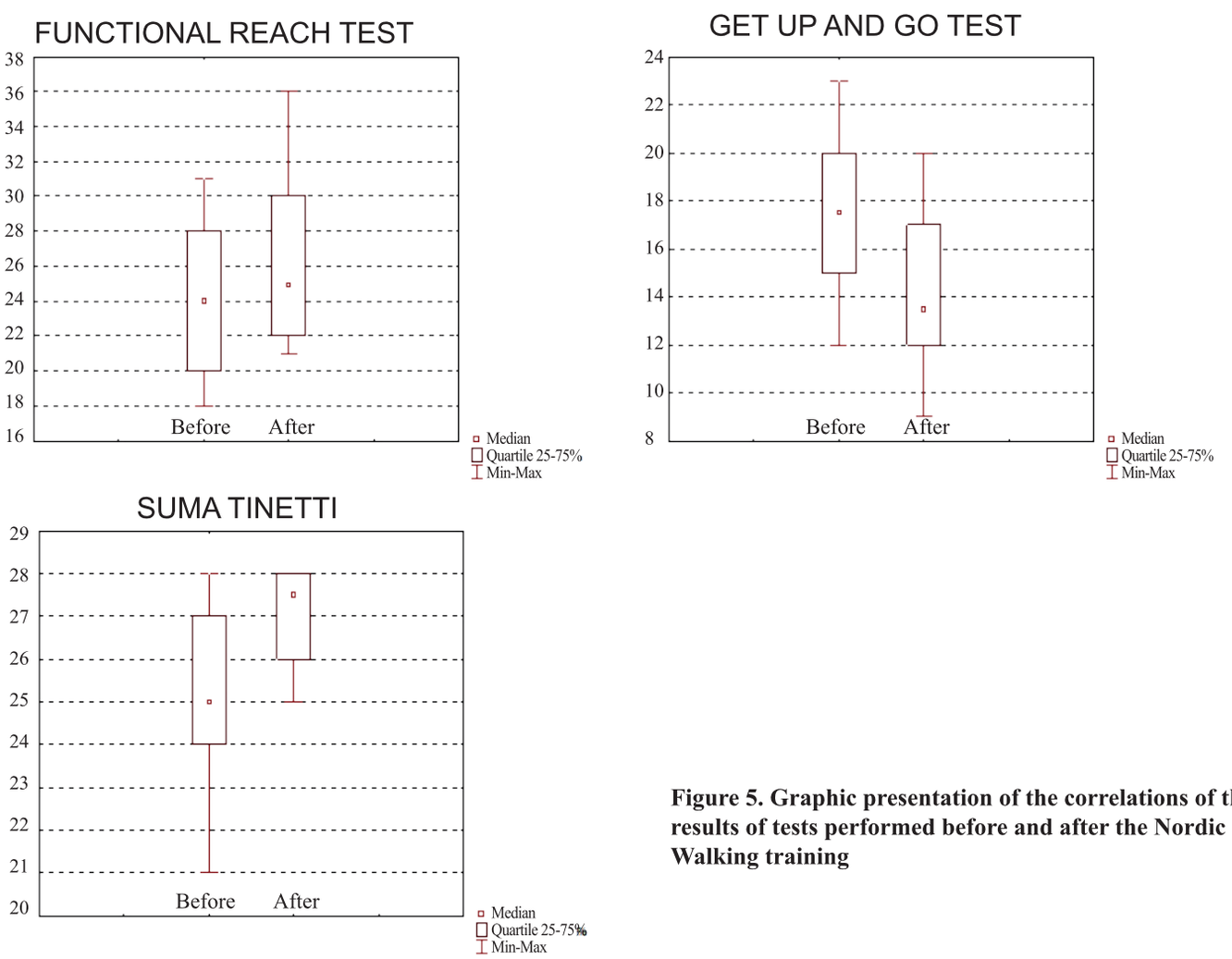

Figure 5. Graphic presentation of the correlations of the results of tests performed before and after the Nordic Walking training

The results proved a statistically significant difference between individual equivalents of the tests BEFORE-AFTER. The obtained values in the Functional Reach Test and Tinetti test are higher after training, whereas the values obtained in the Get up and Go test are much lower after 1-month training. Other variables (VARIABLES) demonstrating the dynamics between tests performed before and after the training were calculated on the basis of statistical tests (Figure 6).

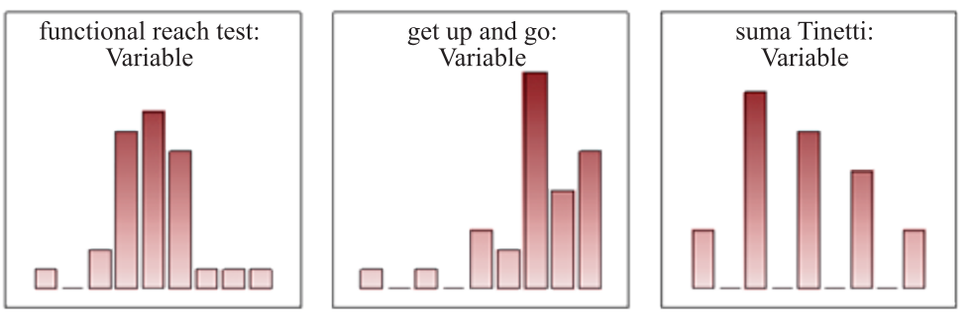

Figure 6. Variables of individual tests after and before the Nordic Walking training

Differences derived from tests before and after the training were correlated with age in order to check whether there was a relationship between the above mentioned dynamics and age. For this purpose Spearman's rank correlation coefficient was used. The results are demonstrated in Table 3 and Figure 7 and 8.

Table 3. Spearman's rank correlation coefficient

	Współczynnik korelacji rang Spearmana R Spearman's rank correlation coefficient R	poziom p p-value
Age & Functional Reach Test – Variable	**-0.474723**	**0.008032**
Age & Get up and Go – Variable	-0.133023	0.483451
Age & Tinetti sum – Variable	**0.423902**	**0.019572**

As it results from the above table – two significant correlations were demonstrated (p-value < level of significance α=0,05) between:
1) age and Functional Reach Test – VARIABLE – the older the subject, the smaller the differences between the test AFTER and the test BEFORE because the value of the correlation is negative, that is the higher the values of variable X, the lower the values of variable Y.

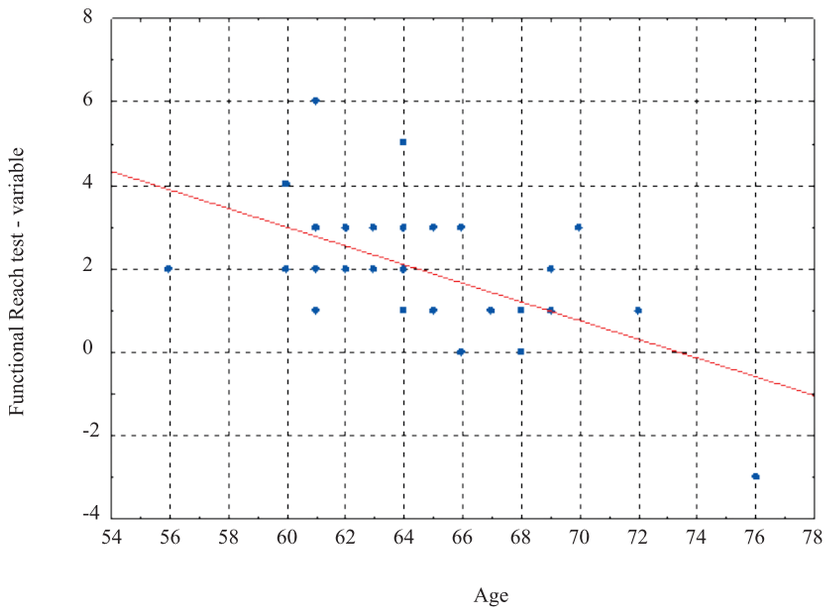

Figure 7. Correlation between age and the Functional Reach Test – VARIABLE

2) age and Tinetti sum – VARIABLE – the older the subjects, the greater the differences between the test AFTER and the test BEFORE, the value of the correlation is positive, that is, the higher the value of variable X, the higher the value of the variable Y (Fig.8)

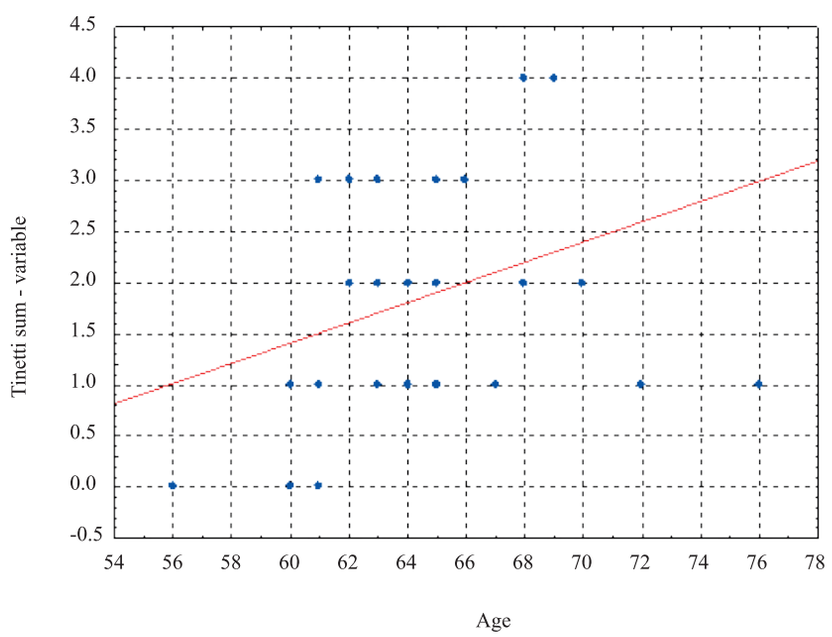

Figure 8. Correlation of age and Tinetti sum – VARIABLE

No correlation was found between age and Get up and Go test.

The study also included subjective assessments of respondents' state of well-being both before and after Nordic Walking training. Wilcoxon signed-rank test showed a significant correlation (p-value < level of significance α=0.05) as shown in Table 4 and in the graphic presentation in Figure 9.

Table 4. Subjective assessment of well-being. Wilcoxon signed-rank test

Questionnaire contents	Number of respondents	Z-test	p-value
'How do you estimate your state of well-being before the training cycle?' & 'How do you estimate your state of well-being after the training cycle?'	30	4.285714	4.285714

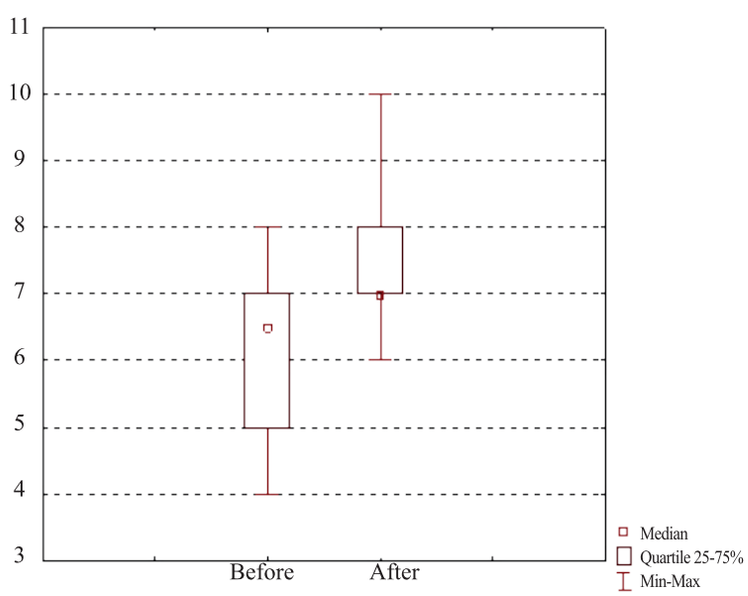

Figure 9. Graphic presentation of the respondents' state of well-being assessment before and after Nordic Walking training

Basing on the statistical analysis of the data obtained from the questionnaires, it was found out in the subjective assessment that the respondents' state of well-being improved after Nordic Walking training.

Discussion

The collected results and information available in the literature on the activity of Nordic Walking, gait and balance allow to issue the opinion that Nordic Walking has a positive effect on gait and balance [6]. Both general fitness training and Nordic Walking training significantly improve agility and body balance in women aged 60-69 years [7]. In the present study a significant difference was demonstrated between the results before and after the training.

In the Functional Reach Test and Tinetti test the obtained values are higher after the training cycle. This reflects the increased ability to maintain balance, reduced abnormal gait which minimizes the risk of falls as confirmed by studies of Dukan et al. [8]. Values obtained in the test Get up and Go test are much lower after 1-month training and they testify to the improvement of the quality of gait. Similar findings were presented in the study of Mathias et al. [9].

Motion exercises performed regularly by the respondents during Nordic Walking training led to changes in the ability to maintain body balance. Tests used in this study may be beneficial for the evaluation of many aspects of motor coordination and motor skills in selected age groups. The selected tests can serve as an indicator of the evaluation of the carried out therapy similarly to the tests applied in individual disease entities [10, 11]. The right training program adapted to the physical condition of study participants is extremely important. Properly designed rehabilitation program increases the strength and improves the condition of muscles, has a positive impact on the patient's balance and coordination and eventually increases the capacity of older people to live independently. The results are consistent with those of Stefaniak et al. [12]. Examining the older population in terms of the impact of Nordic Walking on gait and balance, attention should be paid to how general physical activity affects elderly subjects. Several studies have shown that regular physical activity in subjects aged 60-75 years contributes to enhanced mobility of the upper and lower parts of the body, increases muscle strength of lower limbs and improves the overall body strength. Furthermore, it has been demonstrated that it allows to reduce the stress on joints, it is safe and easily accessible throughout the year [13, 14]. Nordic Walking training can be applied not only in healthy subjects, elderly people but also in those with the history of, among others, chronic obstructive pulmonary disease, fibromyalgia, arterial hypertension or Parkinson's disease [15, 16, 17, 18, 19]. The study demonstrates a positive effect of recreational Nordic Walking in the subjective assessment of well-being which significantly improves the quality of life of people in the age group 60-70 years. Prusik et al. confirmed a beneficial effect of Nordic Walking on the quality of life of older adults [20]. The results of the carried out investigations prove a positive effect of Nordic Walking both on gait and body balance of older adults.

Conclusions

One-month training significantly improved gait and body balance of respondents. A state of well-being in the subjective assessment was also improved by Nordic Walking training. Nordic Walking can become an important element in increasing physical activity of older people and in the improvement of their quality of life.

Adres do korespondencji / Corresponding author

Agnieszka Leszczyńska
Szpital Sonnenberga
Oddział Kliniczny Rehabilitacji Pourazowej
ul.Pieniny 30 , 90-993 Łódź

Piśmiennictwo/ References

1. Polak A., Porzych K., Kędziora-Kornatowska K. i wsp. Poznawczy i praktyczny wymiar gerontologii - interdyscyplinarnej nauki o starzeniu się i starości. Gerontologia Polska, tom 15, nr 3, 51–53.
2. Dix B., Görner K., Błeńska M. i wsp. Nordic Walking as a form of activity for people of all ages. Journal of Health Sciences 2013, Vol. 3, no 11, 63-70.
3. Piech K., Raczyńska B. Nordic Walking - a versataile physical activity. Polish Journal of Sport and Tourism 2010, 17, 69-78.
4. Kukkonen-Harjula, K., Hiilloskorpi, H., Mäntäri A. i wsp. Self-guided brisk walking training with or without poles: a randomized- controlled trial in middle-aged women. Scandinavian Journal of Medicine and Science in Sports, 2007, 17, 316-323.
5. Gondko R., Zgirski A., Adamska M. Biostatystyka w zadaniach. Wydawnictwo Uniwersytetu Łódźkiego, Łódź 2001.
6. Dite W., Temple VA. A clinical test of stepping and change of direction to identify multiple falling older adults. Arch Phys Med Rehabil 2002;83;1566-71.
7. Ossowski Z., Kortas J. (2012). Wstępne badania nad wpływem rekreacyjnego treningu nordic walking na poziom zwinności i równowagi u kobiet w wieku 60-69 lat (Preliminary researches on the influence of nordic walking training on the level of agility and body balance in women aged 60-69 years). Logistyka, nr 3;1783-89.
8. Duncan PW., Weiner DK., Chandler J., Studenski S. Functional reach: a new clinical measure of balance. J Geronto, 1990, Nov; 45 (6);192-197.
9. Mathias S., U. Nayak i B. Isaacs, „Balance in elderly patients the "Get- up and Go" test Archives of Physical Medicine and Rehabilitation, 1986, 67(6); 387-389.
10. Kostiukow A., Rostkowska E., Samborski W. Assessment of postural balance function. Annales Academiae Medicae Stetnensis 2009, 55 (3); 102-109.
11. Jaszczyk B.,Zastosowanie treningu Nordic Walking w postępowaniu rehabilitacyjnym," Rehabilitacja medyczna, 2012, nr 6; 26-31.
12. Stefaniak M.: Nordic Walking w programowaniu aktywności fizycznej - osób starszych. Wychowanie Fizyczne i Zdrowotne. - 2009, nr 11; 43-48.
13. Kozdroń E., Leś A. Aktywność ruchowa w procesie pomyślnego starzenia się. Postępy Rehabilitacji, 2010 nr 1; 49-57.
14. Wiech M., Prusik Ka., Kortas J., Bielawa Ł., Ossowski Z., Prusik Krz., Żukow W. Changes in the ranges of motion in the joints of the upper and lower extremities in elderly people under the influence of the nordic walking training. Journal of Health Sciences, (2013), Tom 3, Nr 5; 267-276.
15. Mannerkorpi K., Nordeman L., Cydr A., Jonsson G. Does moderate-to-high intensity Nordic walking improve functional capacity and pain in fibromyalgia? A prospective randomized controlled trial. Arthritis Research & Therapy 2010; 12 (5); R189.
16. Breyer M.K., Breyer-Kohansal R., Funk G.C. i wsp. Nordic Walking improves daily physical activities in COPD: a randomized controlled trial. Respiratory Research 2010; 11; 12.
17. Purzycka D., Prusik Ka, Bohdan M. i wsp. Effect of 3-month Nordic Walking training on arterial blood pressure in women aged 60 years and over. Nadciśnienie Tętnicze 2011 : t. 15, nr 6; 335-340.
18. Reuter I., Mehnert S., Leone P., Kaps M., Oechsner M., Engelhardt M. Effects of a flexibility and relaxation program-me, walking, and nordic walking on Parkinson's disease. J. Aging Res. 2011; 2011: 232473.
19. Ochman M., Jastrzębski D., Wojarski J., i wsp. Nordic walking as a new model of pulmonary rehabilitation for patients referred for lung transplantion- a preliminary report. Kardiochirurgia i Trakochirurgia Polska, 2010; T. 7, nr4; 452-457.
20. Prusik Ka., Zaporozhanov V., Prusik Krz., Görner K. (2010). Rekreacyjne uprawianie Nordic Walking a jakość życia osób w wieku 60-70 lat. Pedagogika, Psihologia ta Mediko-Biologicni Problemi Fizicnogo Vihovanna i Sportu. Charków, 10; 115-117.