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Changes in the body posture of elder women under the influence of various Nordic walking training programs

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Changes in the body posture of elder women under the influence of various Nordic walking training programs

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C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background: One of the effects of involution is the change in the body posture. Muscles lose their flexibility and strength, causing the typical changes in body posture of the elderly. Hyperkyphosis is a typical feature of the posture, which leads to serious health problems. The aim of the study was to analyse changes in the body posture of elderly women who took part in diversified Nordic walking training.

Material and methods: The study group comprised 90 elderly women divided into two experimental groups and control. The main method was an experiment. The tested women took part in a 6-month Nordic walking training cycle. Women from the control group did not take part in any organised form of physical activity. Evaluation of the body posture was made by the silhouette-based Staffel method.

Results: Nordic walking training has led to certain changes in the body posture. Women from experimental groups have improved their body posture. In the control some significant negative changes have been observed.

Conclusions: Nordic walking is extremely useful for modelling body posture of the elderly. When the programme is complemented with the strengthening and stretching exercises, which shape the postural muscles, the effects are intensified.

Key words: Nordic walking, body posture, elderly.

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INTRODUCTION

The consequence of the involution process is e.g. commonly known changes in the body posture. With age, muscles lose their elasticity and strength; most of the active tissues deteriorate; typical changes in posture and mobility occur.

The body posture is defined as the position of individual segments of the body that is appropriate for a person who is freely standing in an upright position, adopted every day [1]. It is a characteristic part of the body, realising itself ontogenetically together with the general process of development and involution of the body [2]. It is not only an anatomical concept referring to the construction and distribution of individual body parts, but above all, a functional concept. It is a specific motor habit that is shaped over the whole life [3]. The posture is expressed by the body silhouette, which is an individual feature of each person [3, 4].

The correct posture is such an arrangement of individual sections (segments) of the body not affected by pathological changes which ensures optimal stability, requires minimal muscular effort to maintain it, guarantees high static and dynamic performance and creates conditions for proper placement of internal organs [2, 3]. In a good posture, individual body sections maintain harmony in mutual arrangement, ensuring smooth movements, and support stability with the least energy consumption [5].

The body posture changes throughout the entire life depending on the health condition, nutritional status, age, sex, body mass, degree of skeleton mineralization, changes in the motor organs, which occur already at the age of 25–30 years, physical loads, mental states, attitudes, temperament, lifestyle and many other factors [6–8].

The beginning of involutional changes in the field of body posture cannot be determined precisely. They start between the age of 40 and 50 years, and their initially slow course speeds up after the age of 60 years [8, 9]. Kasperczyk [3] indicates that even above 35 years of age, postural deterioration may occur, as a result of which the abdomen begins to protrude and slightly sag, all the physiological curvature of the spine deepens, and at the same time due to changes occurring mainly in the intervertebral discs, its length decreases.

In middle-aged and elderly people, some of the muscles weaken over time, while others are shortened. Both changes have an adverse effect on health and physical fitness, which manifests itself as the ‘aging’ of the posture and changes in the stereotype of movement [10]. The body posture of the elderly differs significantly in most parameters from the posture of individuals aged 20–25 years, in both planes – frontal and sagittal. These differences are also confirmed as far as the sex criterion is concerned [9]. Over the years, the spine is shortened, stiffened and kyphotic deformity (retroflection) [4].

The angle of kyphosis increases with age, with the most rapid rise between the fifth and the sixth decade of life [11]. On the other hand, lumbar lordosis gets flattened, accompanied by a decrease in the inclination angle of the lumbo-sacral spine, which results in a characteristic posture of the body in a standing position with the head advanced and the tilted upper body [12, 13]. There is also compensatory bending of the lower limbs in the hip and knee joints [8].

The causes and consequences of hyper-kyphosis have not been investigated well yet. The results of numerous studies show that it is not only a cosmetic deformity, but it is associated with an increased risk of adverse health effects, with a subjective sense of worse health, spine ache, deteriorated functions of lower limbs, increased body sway, gait instability and reduced mobility associated with the increased risk of falls, decreased life activity, caused by leaving home less frequently (in comparison to individuals with a correct posture), worse well-being and a subjective sense of lower satisfaction with life, worse functional efficiency, and a higher mortality rate [14–19].

Significant postural plasticity carries the risk of developing abnormal symptoms under the influence of recurrent or long-term adverse factors, but at the same time creates the chance to control its development consciously by eliminating and reducing adverse effects, and stimulating the desirable ones [20]. In connection with the above, the aim of the study was to analyse changes in the body posture of elderly women participating in various Nordic walking training programs.

MATERIAL AND METHODS

The study group included 90 women aged 60–74 years, with no health contraindications to participate in physical activities. The respondents were divided into 3 groups: 2 experimental groups (EG1 and EG2) and 1 control group (CG). The leading research method was an experiment. The respondents participated in a 6-month Nordic walking training cycle, which included 73 training sessions, 60 minutes each. The training program of one of the experimental groups (EG1) was supplemented with exercises shaping postural muscles, suggested on the basis of analysis of functional changes in muscles, carried out during the main part of a training session. Both groups did breathing exercises during each session. The control group did not participate in any organised form of physical activity. The effectiveness of programs was assessed using the Staffel method. Body postures were classified simultaneously by 2 assessors. The last research tool was a questionnaire, using which the changes in the body posture were subjectively assessed by the respondents themselves.

RESULTS

After completing the 6-month training cycle, the changes in the posture of the experiment participants were analysed, taking into account the group they belonged to. The obtained results are presented in Table 1.

Table 1. Characteristics of body posture in relation to the Staffel typology as before and after the experiment in terms of belonging to the study groups

	EG1				EG2				CG			
	1		2		1		2		1		2	
	n	%	n	%	n	%	n	%	n	%	n	%
normal posture	9	30.0	22	73.3	8	26.7	16	53.3	9	30.0	5	16.7
rounded backs	12	40.0	6	20.0	14	46.7	9	30.0	15	50.0	18	60.0
flat back	8	26.7	2	6.7	7	23.3	5	16.6	6	20.0	6	20.0
concave back	-	-	-	-	-	-	-	-	-	-	-	-
rounded-concave back	1	3.3	-	-	1	3.3	-	-	-	-	1	3.3

The three groups, EG1, EG2 and CG, which were included in the study did not differ significantly in terms of the body posture before the experiment, which means the percentage of individuals with an abnormal body posture did not significantly differ between the groups, and did not reach 70% in any of them.

Due to the small number of individuals with the normal body posture, only those having the abnormal posture before the start of the study were included in the evaluation of the quality of postural changes. After the end of the experiment, it was revealed that there was a significant difference in the percentage of individuals with the correct body posture ($F = 13.05$; $p = .0000$), which means that the body posture changed from abnormal to normal.

Changes concerning the discussed feature were observed during the 6-month period. The respondents participating in various training programs were characterised by improved posture, while the women from the control group – by its further deterioration.

Both programs brought along more than twofold increase in the number of individuals classified as having the 'normal posture'. Initially, only 1/3 of the women had the correct posture, while after the end of the experiment, as many as 48% of them. Higher effectiveness was achieved, in accordance with the assumption, due to the program supplemented with exercises shaping the postural muscles (EG1), thanks to which more than 73% women had the correct body posture. In group EG2, more than half of the respondents were qualified to this category, while in the control group almost a two-fold decrease in the percentage of individuals with the 'normal posture' was observed.

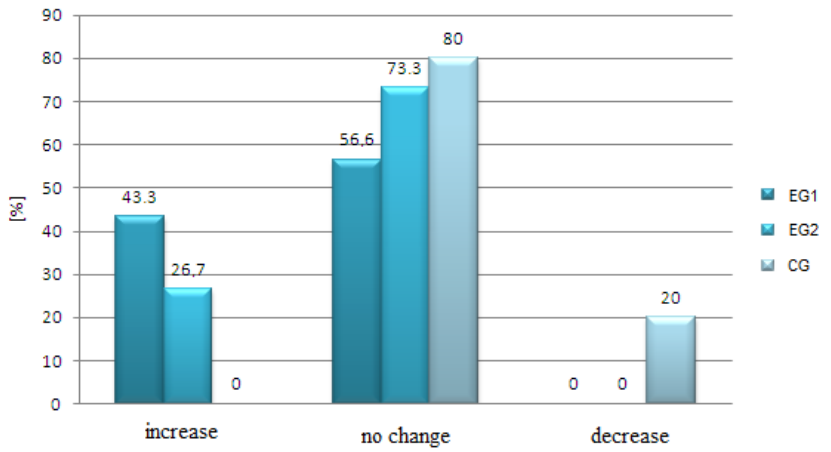

Fig. 1. Characteristics of postural changes in individual groups after the experiment [Own research]

Among the physically inactive women, the percentage of subjects with rounded backs, which was the most characteristic in that age group, increased by 10%, while in the EG1 group, it decreased by half. The EG2 group was characteri ed by an almost 17% decrease.

After the end of the experiment, 60% of the respondents from the CG group, 30% from EG2 and only 20% from EG1 had rounded backs, which demonstrated the effectiveness of the proposed training in correcting this body deformation, which itself is associated with serious health consequences.

The analysis of the 'flat back' category revealed that the number of respondents with this feature from the GEEG1 group decreased by 3/4, with 7% in GEEG2 respectively, while the percentage of the GKCG group respondents did not change. The number of respondents with round-concave backs decreased by 100% in the experimental groups, while in the GKCG group there appeared one elderly woman with this condition. Like at the beginning of the experiment, the 'concave back' category did not refer to any of the respondents.

Walking with Nordic walking poles is an effective form of physical activity in terms of correcting the body posture of elderly people, and the introduction of exercises that shape postural muscles intensifies the obtained results. In addition, the selected body posture method is sufficient to record changes taking place during the training, as well as involuntary involutional changes in the posture. The graphical presentation of the observed changes observed is shown in Figure 2.

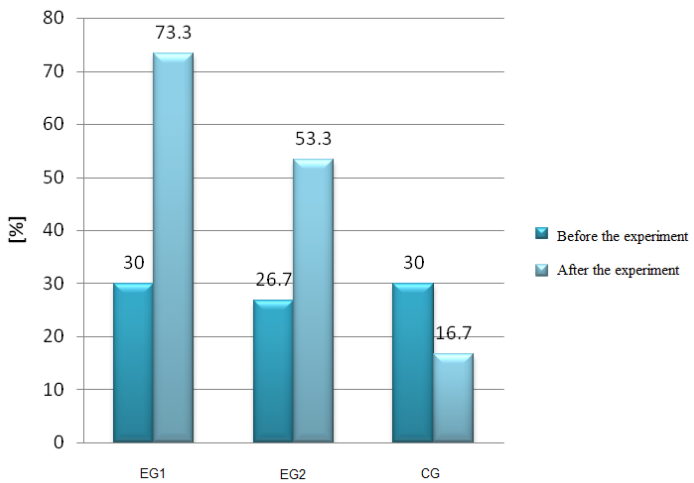

Fig. 2. Percentage of correct posture in individual groups before and after the experiment [Own research]

The posture analysis performed by the observers was confronted with the respondents' subjective assessment of their own posture by the respondents. The results obtained in the survey are presented in Table 2.

Table 2. Characteristics of the respondents' subjective assessment of their body posture by the respondents based on the questionnaire by the status after the end of the experiment in terms of belonging to the study groups

	Experimental group 1		Experimental group 2		Control group	
	n	%	n	%	n	%
any changes	4	13.3	13	43.4	14	46.7
positive changes	26	86.7	15	50.0	-	-
unfavourable changes	-	-	1	3.3	12	40.0
no opinion	-	-	1	3.3	4	13.3

The respondents who actively participated actively in the proposed forms of training, confirmed their effectiveness in posture correction.

The majority of seniors from the GEEG1 group (86%) observed positive training effects. The remaining approximately 13% of the respondents believed that their posture did not change. As far as the GEEG2 study group is concerned, 50% of the respondents noticed the beneficial impact of training on their own posture, and over 43% did not see any changes. Only one woman observed unfavourable changes, and one had no opinion about this matter.

Physically inactive people (40% of the respondents) often observed unfavourable changes in their own posture. Nearly 47% of them believed that their posture did not change, and over 13% had no opinion on this subject. None of the physically inactive women observed any improvements concerning the discussed feature.

The uniform direction of the changes observed in the body posture of women participating in the experiment with the observers' assessment, suggests the correct selection of the research methods.

DISCUSSION

Body posture which is, among other things, an expression of current well-being of an individual is important for the health of seniors due to its plasticity. It can also be modelled with a morphofunctional indicator. Ignasiak et al. [21] claim that the rate of changes associated with loss of bone mass, muscle mass and muscle tension, directly affecting the shape of physiological curvature of the spine, intensifies after the age of 60 years, depending on sex, body structure and lifestyle. These observations are confirmed by Drzał-Grabiec et al. [9], which is why women aged 60–74 years were invited to take part in the experiment (early elderly age).

Deepened thoracic kyphosis is a common phenomenon among the elderly and it is, unfortunately, often ignored. Although there are no uniform criteria for diagnosing hyperkyphosis, current studies estimate that it occurs among 20% to 40% of seniors [17]. As Katzman et al. [22] revealed in their study conducted on a group of 1172 individuals aged 70–79 years, 21% of the respondents suffered from hyperkyphosis. This phenomenon mainly affects white women (30%). The results of the presented studies prove that the lower density of the muscle tissue is associated with hyperkyphosis in the healthy elderly population. This potentially modifiable risk factor can be mitigated by intervention in the form of physical exercise.

The results of the authors' own research indicate that only 30% of women aged 60–74 years have the correct body posture, which is a result of continuous negative changes occurring with age. Only 53.6% of 7-year-old children, also assessed using the Staffel method, were characterised by the correct posture, and already in the group of 11-year-olds this percentage decreased to 52.0% [23]. According to Pawlicka-Lisowska et al. [24], 33.3% of high school graduates (19 years of age) are characterised by deep chest kyphosis, while the results of the authors' own research show that this problem affects as many as 45.5% of women in the period of early old age.

According to Ignasiak et al. [21], the angle of thoracic kyphosis increases gradually from 64 years of age both in women and in men. Deepened kyphosis adversely affects health, physical fitness and the quality of life, increases the risk of fractures and mortality, and, as confirmed by the results of the authors'

own research, it is enough to restore symmetrical tension of the muscles to correct the body posture of the elderly. This result was achieved in the EG1 group with the help of the training program supplemented with exercises that shape the postural muscles. They can 'be even very weak, but they should be symmetrically tense' [2].

Appropriately selected exercises can play a fundamental role in the prevention of excessive kyphosis but also optimize the posture of individuals affected by this deformity or minimize postural disorders associated with it [25].

Despite the enormous popularity of Nordic walking in the group of seniors, no study was found on the characteristics of postural changes in people undertaking this activity. The aforementioned benefits concerning posture improvement, described by INWA [26] were therefore considered intuitive, and it was decided to verify them in this study.

Supplementing the training program with exercises that shape postural muscles enables postural plasticity to be used for health-promoting purposes, because 'all muscles that stabilise posture require constant, systematic exercise, if they are to ensure the spine full efficiency until the late old age [6]. Therefore, a set of exercises aimed at balancing seniors' muscle tone has been developed.

Subjective assessment performed by the observers was confronted with a subjective evaluation of changes in the body posture made by the participants of the experiment. Data analysis confirms the consistency of the results, where nearly 87% of the EG1 group respondents believed that their posture improved, with 50% in the EG2 group respectively. However, no one from the CG observed any favourable changes in their posture within 6 months. In addition, 40% of women from the CG group claimed that their posture was adversely affected.

A comparison of the effectiveness of the proposed training programs, completed by women aged 60–74 years, in the correction of posture with others described in the literature is extremely difficult, because in each of the studies different evaluation methods were used. The timeliness of the topic in the field of geriatrics still requires a lot of research on the changes in the body structure and posture which appear with age [27]. Unfortunately, the interest of scientists in the body posture of the elderly is still small. The results of previous studies indicate a promising role of exercises in improving the body posture and components and show the deep sense of developing training programs for the elderly, taking into account all possible changes in the course of involution, which was all covered by this study. Supplementing the training program with exercises that shape postural muscles enables postural plasticity to be used for health-promoting purposes, because 'all muscles that stabilise posture require constant, systematic exercise, if they are to ensure the spine full efficiency until the late old age [6]. Therefore, a set of exercises aimed at balancing seniors' muscle tone has been developed.

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CONCLUSIONS

1. A 6-month Nordic walking training affects the body posture of elderly women, not only stopping the involutionary changes occurring in the organism, but also causing favourable changes in the way it is corrected, so the proportion of women with a correct posture has increased from nearly 30% to 53%. In addition, supplementing the training with postural shaping exercises intensifies these effects by 20%, as a result of which 73% of the surveyed women were classified as having 'normal' postures.

2. The results of the experiment confirm the effectiveness of the two different training programs, while emphasising that introducing exercises shaping postural muscles is justifiable. The program supplemented with exercises that shape postural muscles should be included in health training for individuals over 60 years of age.

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