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THE STATE OF HEALTH OF WOMEN AGED 20–59 AT DIFFERENT LEVELS OF PHYSICAL ACTIVITY

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ABSTRACT

Purpose. The assessment of the state of health of population using positive indices is crucial for health promotion. The following study focuses on the levels of somatic growth and physical fitness of adult women living in small towns and on their dependence on physical activity. **Basic procedures.** The research sample consisted of two groups of women: one consisting of women taking part in health-related training and a control group. All in all, 421 subjects participated in the study aged 20–59 years, divided into age 'decade' cohorts. The procedures applied included measurements of the main somatic parameters and physical fitness tests. **Main findings.** More favorable somatic parameters and a higher level of physical fitness were noted in the training women than in women from the control group. **Conclusions.** Systematic physical activity of two 50-min training units per week is an essential stimulation of women in productive age.

Key words: physical fitness, somatic growth, health-related training

Introduction

The emerging global culture based on the dynamic development of technology, communications and the media has been exerting an unquestionable impact on human beings and their living environment. It might be hazardous, but it is also conducive to fostering important values, including health.

A lifestyle dominated by consumption and passivity, reliant on technological development, isolates man from his natural conditions and inhibits stimuli for proper psycho-physical development [1].

Present-day communication has an inhibitory influence on physical activity. The resultant hypokinesia can be a threat to man's health and social status. Modern civilization presents man with enormous challenges and upsets man's homeostasis and interactions with the social environment. It seems necessary that one's adaptability to physical effort should be increased [2]. At the same time, the concept of health is no longer confined to the domain of medicine. More and more areas of public life become included in the widely understood healthcare and prophylaxis. The assessment of the state of health of a population using the so-called positive indices, i.e. physical activity, physical fitness and somatic parameters, is crucial for health promotion and prevention of diseases, especially civilization diseases. A number of researchers recognize physical fitness as a measure of human health [3–9]. Increased physical activity not only develops one's physical sphere but also different psycho-social aspects of personality. It becomes a significant element of culture and healthy lifestyle of modern man, and – to some degree – compensates for the negative results of the 21st-century civilization [10, 11]. Research shows that systematic physical activity increases resistance to stress and enhances treatment of a number of illnesses and disorders [12–14].

The most anticipated effect of increased physical activity among adults is the maintenance of the most optimal level of circulatory and respiratory parameters, body composition and motor efficiency [4, 11, 15, 16]. A significant reduction in physical activity may lead to adverse changes in the proportion of basic body components, mostly to the growth of adipose tissue. It can be conducive to diseases of the circulatory system and

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metabolic disorders or even death [4, 12, 16–19]. In Poland, about 70% of men and women are at the risk of health loss due to overweight and obesity. This risk increases with the growth in body mass [19–21].

It thus seems necessary to carry out a thorough analysis of the state of health of adult Poles, with regard to community differences, which are still quite extensive in Poland [22]. The data gathered could serve as tools for diagnosis of the so-called positive measures of health and determine the future direction of programs shaping pro-health behavior patterns in society.

The present study focused on the analysis and assessment of selected aspects of the state of health of female inhabitants of the town of Nysa, engaged in different levels of physical activity.

Material and methods

The study was carried out in the town of Nysa (pop: 50 thousand) in the Opole Province, Poland, in 2003. The subjects included a group of 301 women who had participated in some organized forms of physical activity on a regular basis for at least 6 months, and a control group of 120 women, aged 29–59 years. The subjects who practiced aerobics amounted to about 75% of the training women. The group of training women was subdivided into age ('decade') cohorts according to their age. The control group consisted of 30 subjects in each age cohort.

The health training in the group examined was led by an instructor, 2 × 50 min a week. Each 50-min session consisted of three parts: opening (aerobic exercises), main part (exercises aimed at strengthening particular muscle groups) and closing (relaxation exercises and info about a healthy lifestyle).

The following somatic measurements were used in the study: body height and weight to calculate the BMI (body mass index); and the total measurement of skinfold thickness in three anatomical sites (brachial, subscapular, abdominal) [23].

The subjects' physical fitness was measured using the following tests [24]:

- plate tapping test measuring the speed of hand movement (s),
- handgrip test measuring the forearm muscle strength (kG),
- sit and reach test measuring the flexibility of the lower back and hamstring muscles (cm),
- standing broad jump measuring the explosive power of the legs (cm).

The study also used data gathered from a standard questionnaire filled in by the subjects.

The results obtained were processed statistically. The arithmetic mean ($\bar{x}$), standard deviation (SD) and index of variability (v) were used in the statistical analysis. The significance of the differences was measured with Student's t-test for independent variables.

All statistical calculations were made in the Laboratory of Biokinetics and Statistics of the Chair of Anthropokinetics in the University School of Physical Education, Wrocław, using the Statistica for Windows 6.0 software package.

Results

Body height and weight

In the cohort of 20-year-olds the training women were significantly higher than their non-training counterparts. In other age (decade) cohorts the body height revealed non-significant differences. The body height was lower with age, both in the group of training women and in the control group. The low indices of variability demonstrated a significant uniformity of body height in the other cohorts.

The body weight was observed to increase with age. The most slender body build was observed among the 20-year-olds. In other age cohorts, both in the training women and the control group, the body weight increased. The non-training women were significantly heavier than the training subjects, and in the cohort of 40-year-olds the difference amounted to 7 kg between both groups under study.

The statistical spread pointed to a significant variability in the subjects' body build, much higher among the non-training women (Tab. 1).

Body mass index (BMI) and fat tissue

The body mass index (BMI) is commonly used to assess body fat deposition, obesity and nutritional status. It is also used to estimate the body mass as a phenotypical characteristic determined by genetic makeup and environmental influences [22, 23, 26, 27].

The mean BMI increased with age in the groups of physically active and inactive women, however it was much higher in the latter (Fig. 1).

The BMI showed significant differences between the active and inactive women in favor of the former,

Table 1. Statistical analysis of selected somatic and motor parameters in women under study

Parameter	Age cohort	Training			Non-training		
		$\bar{x}$	SD	v	$\bar{x}$	SD	v
Age (years)	20–29	24.47	2.94	12.03	24.43	3.66	15.00
	30–39	33.63	2.91	8.64	34.40	3.06	8.89
	40–49	44.25	2.93	6.61	44.67	2.68	6.01
	50–59	53.95	2.78	5.15	53.77	3.05	5.67
Body height (cm)	20–29	167.50	6.04	3.61	165.25	7.61	4.61
	30–39	165.74	6.47	3.90	165.00	5.57	3.38
	40–49	163.52	6.45	3.94	163.65	6.65	4.06
	50–59	161.50	4.99	3.09	162.42	5.69	3.51
Body weight (kg)	20–29	58.50	8.87	15.15	60.31	9.71	16.10
	30–39	**63.02**	9.81	15.57	67.23	11.52	17.14
	40–49	**65.35**	9.00	13.77	72.91	10.92	14.98
	50–59	**67.91**	8.64	12.72	73.16	12.50	17.09
BMI	20–29	20.79	2.50	12.01	22.12	3.64	16.46
	30–39	**22.89**	2.89	12.61	24.69	4.11	16.63
	40–49	**24.43**	3.12	12.76	27.25	4.09	15.02
	50–59	**26.05**	3.22	12.36	27.69	4.17	15.07
Skinfold thickness (mm)	20–29	**52.62**	13.53	25.70	63.72	16.63	26.10
	30–39	**64.41**	15.46	20.01	74.17	17.26	23.27
	40–49	**69.74**	17.51	25.11	85.69	16.03	18.70
	50–59	**77.30**	13.82	17.88	88.70	16.12	18.18
Plate tapping (s)	20–29	**12.31**	1.07	8.70	15.33	2.13	13.90
	30–39	**13.49**	1.95	14.44	15.31	2.42	15.80
	40–49	**14.19**	1.73	12.20	16.56	3.19	19.29
	50–59	**15.68**	1.72	10.99	16.62	2.59	15.57
Sit and reach (cm)	20–29	**26.78**	5.52	20.60	21.10	6.57	31.11
	30–39	**26.90**	5.29	19.68	21.23	6.04	28.43
	40–49	**26.23**	5.30	20.21	19.32	5.70	29.49
	50–59	**24.50**	6.24	25.46	18.04	6.31	34.99
Handgrip strength (kG)	20–29	33.87	4.27	12.60	32.43	4.40	13.57
	30–39	**34.03**	4.58	13.47	31.83	3.20	10.04
	40–49	33.33	3.79	11.38	31.70	4.79	15.10
	50–59	30.61	3.25	10.61	29.23	3.95	13.50
Standing broad jump (cm)	20–29	**162.86**	17.89	10.99	140.37	19.62	13.98
	30–39	**150.58**	14.01	9.31	131.10	13.78	10.51
	40–49	**136.26**	15.67	11.50	116.13	19.11	16.46
	50–59	**120.49**	14.72	12.22	112.87	13.59	12.04

Statistical significance at $p < 0.05$ in bold

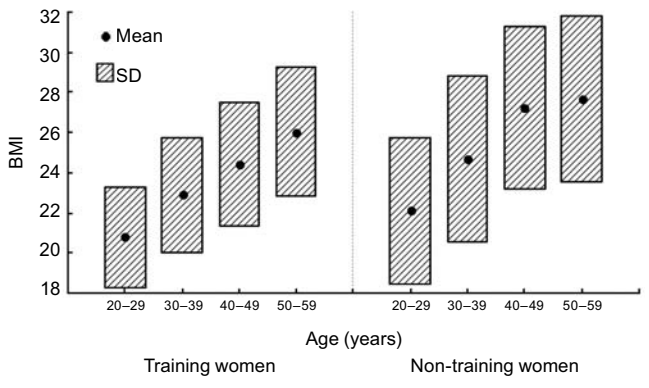

Figure 1. Mean BMI of women under study

with the exception of the youngest cohort where the difference was statistically non-significant.

The lower values of the index of variability among the training women point to a greater uniformity of the index values with reference to the control cohorts.

The World Health Organization (WHO) [28] describes the BMI ranges in the following weight statistical categories: underweight (to 18.49), normal (18.5–24.9), overweight (25–29.9) and obesity (30 and more).

The sample under study was predominantly in the normal range, with the exception of the oldest cohort in which 50% of subjects were overweight. The percent-

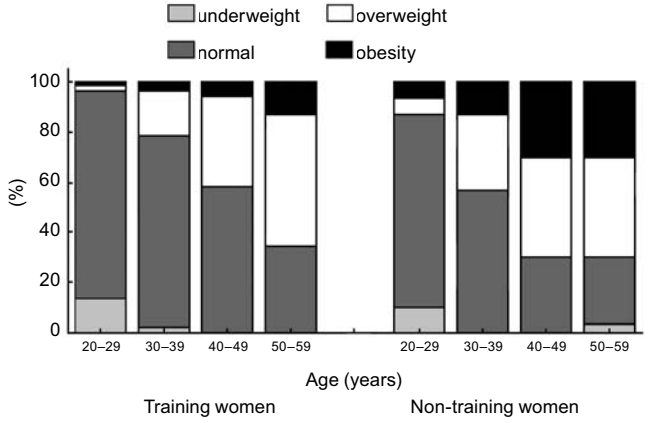

Figure 2. Percentage BMI values according to WHO ranges

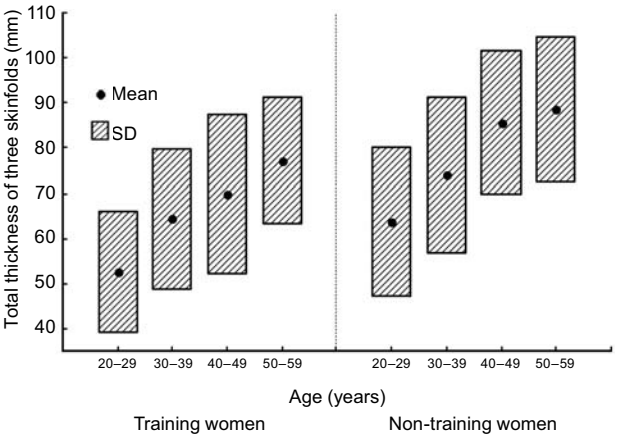

Figure 3. Mean total thickness of three skinfolds

age of the index value in the normal range (18.5–24.99) decreases with age, while the percentage of overweight and obese women increases (Fig. 2).

The analysis showed that young women up to 30 years of age had similar BMI values. The majority of physically active women were slender, whereas the majority of non-training women were overweight or obese. Among the 30-year-old physically inactive women, the number of overweight and obese subjects exceeded 40%; while it was twice as low in the group of training women. Among the 40-year-olds and 50-year-olds in the control group only 30% were in the normal range. In the other cohorts of the control group 30% were obese and 40% were overweight. In the cohorts of 40-year-old and 50-year-old physically active women the number of obese persons amounted to 5 and 12%, and of overweight persons to 34% and 50% respectively. Nearly 60% of the 40-year-old training women were in the normal BMI range. In the cohort of 50-year-olds the percentage in the normal BMI range was below 40%.

The skinfold thickness significantly increases with age in both groups under study. However, in the parallel cohorts in the group of physically active women the amount of fat tissue was significantly lower than in the group of non-training women. The measures of statistical spread pointed to a great variability within the groups under study (Fig. 3).

All in all, it can be concluded that the subjects undergoing health training achieve better BMI and skinfold thickness values than the subjects from the control group. In the case of the former more women were in the normal BMI range, and a decisively smaller number in the overweight and obese ranges.

Speed of hand movement

As expected the speed of hand movement, as measured with the plate tapping test, increases with subjects' age, and the longer performance of the test performance indicates a decreasing hand speed (Fig. 4).

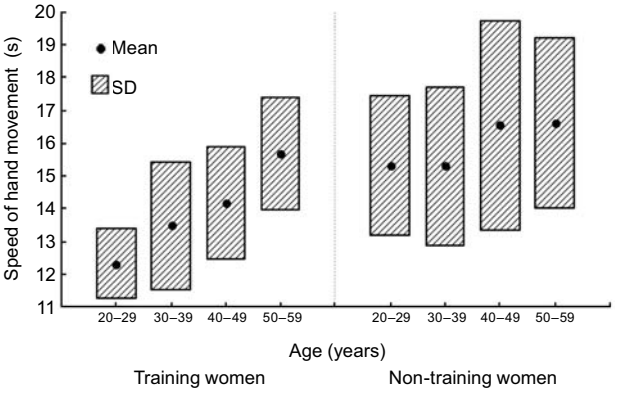

Figure 4. Mean speed of hand movement

The analysis of differences between the cohorts of training and non-training women revealed that the former achieved a significantly shorter performance time of the plate tapping test than their non-training counterparts.

The values of the index of variability in the group of training women were lower than in subjects from the control group and they show that physically active women are more uniform in hand movement speed than their counterparts from the control group.

Flexibility of the lower back and hamstring muscles

Flexibility is an element of physical fitness, which particularly determines an individual's wholesomeness and independence. The sit and reach test performed with the subject's sitting on the floor with legs out straight ahead was chosen for the study as a determinant of flexibility of the lower back and hamstring muscles.

The flexibility remained at a similar level among the training women between 20 and 49 years of age; the test results were lower among the 50-year-old subjects. In the non-training women the flexibility level was significantly lower than in their training counterparts (Fig. 5).

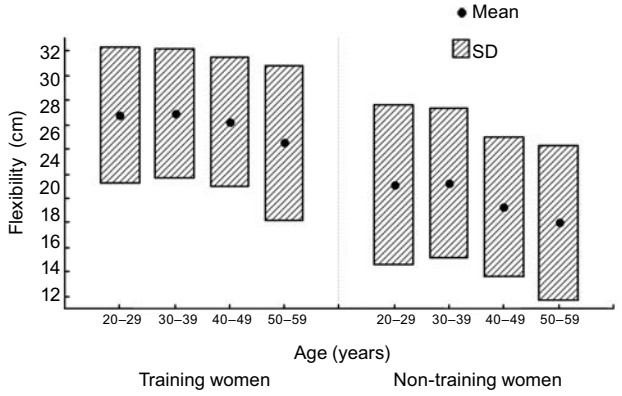

Figure 5. Mean flexibility of the lower back and hamstring muscles

The mean results of the sit and reach test revealed statistically significant differences between all cohorts of training women and their counterparts from the control group. The values of index of variability indicates greater uniformity of results among the training subjects than subjects from the control group.

Forearm muscle strength

In the group of training women the forearm muscle strength decreased starting with the fifth decade of life. In the younger age cohorts the test results were at a similar level (Fig. 6).

The declining muscle strength with age was also observed in the control group. A significant decrease in muscle strength was recorded in women over 50 years of age. Non-training women featured lower muscle strength than their physically active counterparts in each age cohort.

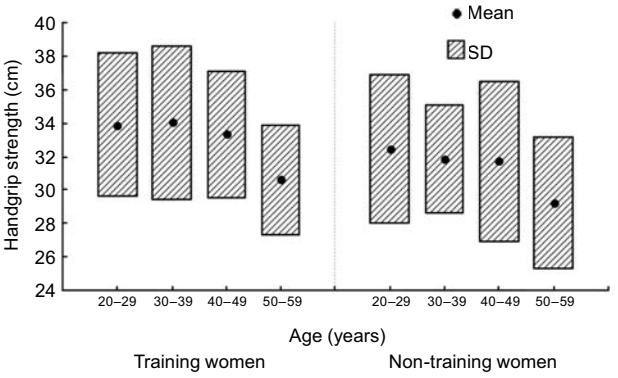

Figure 6. Mean forearm muscle strength

Explosive power of the legs

In terms of explosive power of the legs the standing broad jump test results were lower with age in both groups of subjects under study, which is clearly linked to the involutional processes in the human body. A comparison of the mean results of the standing broad test in both groups under study yielded statistically significant differences between all age cohorts. The physically active women achieved a significantly higher level of the explosive power of the legs than women in the control group (Fig. 7).

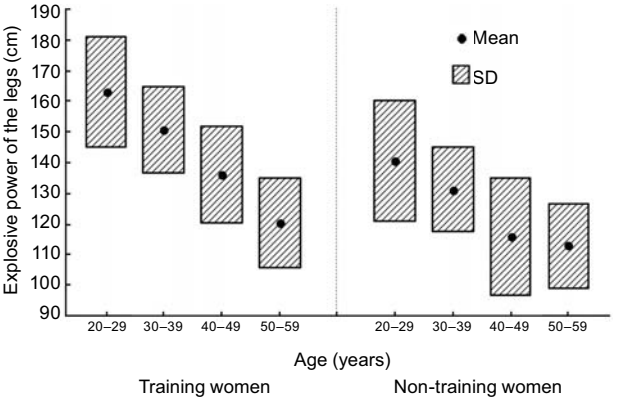

Figure 7. Mean explosive power of the legs

Discussion

Systematic and regular physical activity is an inseparable element of a healthy lifestyle, which definitively positively affects one's state of health and life quality. Numerous studies carried out in different countries have shown that a low level of education and income is related to a low level of physical activity [19, 29]. A higher level of education is conducive to the develop-

ment of a greater awareness of one's own health and pro-health behavior patterns.

The results of our questionnaire revealed that 52 to 69% of women who actively took part in the health training had a secondary education, and 37 to 5% had a higher education, depending on the age cohort. 6% (20-year-olds) to 25% (50-year-olds) of the physically active women had a primary education.

In the control group the percentage of women with secondary education (57 to 40% in the oldest age cohort) and primary education (17 to 50% in the oldest cohort) was higher – the highest among the 40-year-olds (47–50%).

Women taking part in health training revealed different reasons for their participation in physical activity. For 20-year-old and 30-year-old women the most important reason was to look attractive. Other reasons were health-related. Among the 40-year-olds and 50-year-olds, health reasons took priority. Some other motives included keeping fit, stress management and establishing new relationships.

The observed tendency of changing body height is associated with a secular trend, i.e. increasing the body height in consecutive generations for about 1–1.5 cm per decade. Besides the changing body height with age is affected by involutional processes in the organ of locomotion manifested by greater spinal curvatures, flattening of intervertebral discs or lowered arching of the foot [14, 25].

Studies carried out in Poland in the late 1980s and early 1990s within the POL-MONICA program, revealed overweight in 38% of women aged 35–64 years and obesity in 30% [30]. The results of the present study show overweight and obesity in 70% of non-physically active women aged 40–59 years. Among their physically active counterparts 34–50% of women were overweight and 5–12% were obese. It can be concluded that systematic physical activity improves the BMI value and significantly reduces skinfold thickness in the group of training women as opposed to the control group. It should also be pointed out that aerobic exercises of moderate intensity reduce the level of the adipose tissue.

The study also showed an interesting inverse proportion between the skinfold thickness and the subjects' level of education, which is a confirmation of results obtained earlier by other authors [19, 22, 30]. It should also be underlined that undertaking physical activity is closely linked with the motivation to improve the image of one's own body, mostly through reduction of the body fat deposition. Thus, also overweight women participated in the organized physical exercises, which might have affected the mean values of body weight in the sample. In spite of this, the study revealed statistically significant differences in favor of the physically active group of women. It can be asserted that systematic physical activity in the productive age positively affects somatic parameters.

Physical fitness is one of the measures of health. Systematic physical activity has undoubtedly a positive influence on health and it lowers the regression of physical fitness in the middle age [12, 16, 30, 31]. The results of the study confirm this tendency and point to a higher level of physical fitness of training women and much slower decline of the mean results of individual tests in comparison with the control group.

Concurrently, the higher results of fitness tests achieved by the training subjects in comparison with the control cohorts confirm the significant effectiveness of the health training used in the study. The results of tests assessing the speed of hand movement, flexibility of the lower back and hamstring muscles, forearm muscle strength and explosive power of the legs were significantly higher in the training group than in the control group. Nowak and Wojtas-Ślubowska [32] also observed a general improvement of physical fitness of women practicing aerobics, with the exception of handgrip strength.

In both groups of women under study a decline in motor skills with age can be observed, which is closely associated with the increasing involutional processes in the body. Numerous studies indicate that increased physical activity can inhibit the aging processes and extend the period of physical fitness in one's life [12, 16, 30–34].

The results of the study point to the need of propagation, organization and planning of health training classes aimed at improvement of people's health potential.

Results and conclusions

1. Women who are physically active feature much better somatic parameters. Their BMI is within the normal range; and among the training women over 50, it slightly exceeds its upper limit. In the control group, the BMI in the cohort of 40-year-old subjects indicated overweight and obesity. This is additionally confirmed by the greater skinfold thickness in non-training subjects as opposed to their physically active counterparts.

2. Physically active women feature a higher level of physical fitness than women in the control group, in particular, in hand movement speed, muscle strength and flexibility of the lower back and hamstring muscles.

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