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Sports Background and Selected Features of Biological Condition in Life Quality of Women over 55

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A B S T R A C T

Population aging is a trend of the 21st century. Correctly administered, physical exercise is believed to significantly influence and modify the aging process, and remarkably decrease deterioration of the psycho-physical condition. The aim of this study was to verify if (and how) competitive sports practiced by women in their youth have influence on their physical fitness and life-quality in adulthood and old age. The study included 94 women who declared leading or having led a physically active lifestyle (49 women did sports in the past, while 45 of them were physically non-active in their youth). Physical fitness resulting from former sport activity was analyzed with the Rikli & Jones test. Significantly better results were obtained by the group of former competitors in the bending forward and walking test. There is a close correspondence between doing sport in the past and mineral bone density, good subjective health evaluation and motor organ diseases. The approach to subjective health evaluation was much better in women who did sport in the past despite their significantly higher prevalence to motor organ diseases. Osteoarticular and muscle disorders may be the negative results of sport performance in the past.

Key words: *physical activity, practicing sport in the past, women, biological condition, physical efficiency*

Introduction

Population aging is a trend of the 21st century. Dynamic medical and technological developments extend lifespans and improve living conditions. Unfortunately, every additional year of life is often related to physical and mental disorders, which are reflected in the deterioration of life quality. A loss of independence may trigger such emotions as poor mood, loss of willingness to live or depression[1]. According to the Public Opinion Research Centre, one third of people over the age of 65 declare dissatisfaction with their health status and only one fifth are satisfied. This may be due to chronic illnesses observed in over one-third of adult Poles, 74% of people from this group are 64[2].

Irreversible changes observed in the aging process are different for each individual. The differences result from biological changes, past illnesses and varied forms of physical activity. Research shows that physically active people, regardless of their physical fitness, are healthier and have a better quality of life in old age. Aging, but physically active people maintain functionality, physical fitness and independence for a longer period of time[3]. Correctly administered, physical exercise is believed to significantly influence and modify the aging process, and remarkably decrease deterioration of the psycho-physical condition. Moreover, an active lifestyle reduces the intensity of aging due to age, for example, bone tissue, loss of muscle mass, balance, endurance and motor coordination. Regularly performed physical exercise also reduces the risk of infection and may lead to a decrease in taking medication[4].

In 2002, the World Health Organization introduced recommendations on physical activity. Following the guidelines, a person, regardless of age, should undertake 30 minutes per day, five days a week, of moderate-intensity physical activity. Strength training, aerobic and balance exercises are very important for people over the age of 65. They prevent falls and early disability occurring due to lifestyle diseases[5,6].

The aim of this study was to verify if (and how) competitive sports practiced by women in their youth have influence on their physical fitness and life-quality in adulthood and old age.

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Research questions:

1. Are there any differences in the level of selected features of biological condition and physical fitness of women who have performed sports in the past?
2. Are there any correlations between doing sports in the past and life quality? If so, then:
3. What are the correlations between the results of the analyzed categorical variables?

Material and Methods

The study included 94 women who declared leading or having led a physically active lifestyle. 49 women did sports in the past, while 45 of them were physically non-active in their youth. All participants were subject to basic somatic measurements (body height and weight). Also, body mass index (BMI) was calculated. The measurements were used to evaluate group homogeneity with regard to morphological body type.

A subject's biological condition being the result of a former sports activity was analyzed based on: differences between the fat level and fat distribution (WHR was calculated from waist and hip circumference and FAT% with TANITA MC-180 MA), bone mineral density (BMD was verified with EXA-3000), and features of the respiratory and cardiovascular systems (Flowscreen apparatus – 780. 578. version 1.3, Jager, heart contraction frequency and systolic and diastolic blood pressure).

Physical fitness resulting from former sport activity was analyzed with the Rikli&Jones test[7].

The following information was selected from the questionnaire: subjective health evaluation and diagnosed diseases: osteoporosis, motor organ, respiratory and cardiovascular systems disease and depression.

Statistical characteristics (means, standard deviation, correlation coefficient, minimum and maximum) were calculated for all the variables (age, body height and weight, BMI and WHR, FAT% BMD, FVC and FEV1, heart rate and systolic and diastolic blood pressure). The significance of intergroup differences between women practicing and non-practicing sports in the past was examined with the Student t-test.

All categorical variables (doing sports in the past, subjective health evaluation, osteoporosis, motor organ diseases, respiratory and cardiovascular systems and depression) were characterized by the dichotomy: yes/no. Categorical variables of the number of women practicing and not practicing sports in the past were presented as percentages (%). The statistical significance of percentages was verified with the χ^2 test.

Coexistence of the categories for the selected factors was examined with multiple correspondence analysis8. The results were considered significant at $p \leq 0.05$ and put in bold.

Results

The analyzed groups of women active and non-active in the past were similar in terms of age, basic level of somatic features and height-weight pr oportions. No statistically significant differences were found in terms of differences of the mean values (Table 1). The results confirmed morphological homogeneity of the compared groups.

TABLE 1
DIFFERENCES IN AGE AND HEIGHT-WEIGHT PROPORTIONS BY SPORT ACTIVITY IN THE PAST

Variable	S		NS		t	p
	mean	sd	Mean	sd		
age [years]	65.48	6.23	66.01	6.03	-0.42	0.68
body height [cm]	159.92	5.52	158.40	4.77	1.42	0.16
body weight [kg]	73.12	12.29	71.92	14.61	0.43	0.67
BMI [kg • m-2]	28.56	4.41	28.66	5.71	-0.09	0.93

S – women who practiced sport in the past

NS – women who didn't practice sport in the past

There were no statistically significant intergroup differences in fat distribution and fat level (WHR. FAT%), bone mineral density (BMD) and cardiovascular features (Table 2). The level of these biological condition features did not indicate any intergroup differences in the adult and elderly women.

TABLE 2
DIFFERENCES IN BODY FAT, BONE MINERAL DENSITY AND CARDIOVASCULAR FEATURES BY SPORT ACTIVITY IN THE PAST

Variable	S		NS		t	p
	mean	sd	mean	sd		
WHR - waist to hip ratio	0.83	0.07	0.84	0.07	-0.07	0.94
FAT [%] – body fat	35.04	5.56	34.63	5.23	0.36	0.72
BMD - bone mineral density	0.35	0.07	0.34	0.11	0.70	0.49
FVC - forced vital capacity	2.82	0.58	2.84	0.57	-0.22	0.83
FEV1 - forced expiratory volume in 1 sec	2.20	0.47	2.25	0.49	-0.49	0.63
FEV1%FVC - ratio of forced expiratory volume in one second to forced vital capacity	78.22	5.21	79.09	6.60	-0.71	0.48
HR – heart rates before effort	69.71	10.24	71.00	10.75	-0.58	0.56
SBP – systolic blood pressure	141.09	23.60	136.14	18.76	1.09	0.28
DBP – diastiolic blood pressure	86.93	12.45	83.07	10.79	1.56	0.12

S – women who practiced sport in the past
NS – women who didn't practice sport in the past

A correlation between doing sport in the past and physical fitness of adult and elderly women was verified with the Rikli&Jones test. The analyzed groups were similar in terms of current physical activity (one of the inclusion criterion). Thus, it can be presumed that differences observed between the groups resulted from the physical activity in the past. Significantly better results were obtained by the group of former competitors in the bending forward and walking test (Table 3). The results reflected better trunk flexibility and endurance in comparison to the non-active women.

TABLE 3
DIFFERENCES IN RIKLI&JONES TEST BY SPORT ACTIVITY IN THE PAST

Variable	S		NS		t	p
	mean	sd	mean	sd		
Grip-strength of dominant hand [kG]	29.39	5.88	28.48	5.57	0.74	0.46
Standing up from chair [n]	18.32	4.88	17.11	3.67	1.31	0.19
Arm bending [n]	21.45	5.55	20.84	4.05	0.59	0.56
Walking test [m]	594.51	83.52	539.92	101.24	2.76	0.01
Bending forward [cm]	6.94	8.80	2.84	6.79	2.45	0.02
Reaching behind back [cm]	-0.34	8.55	-2.11	6.80	1.08	0.28
Stand up and walk [s]	5.85	1.22	6.00	0.89	-0.69	0.49

S – women who practiced sport in the past
NS – women who didn't practice sport in the past

A correlation between the selected elements of life quality and doing sport in the past was verified with the χ^2 test. The number and the percentage of women are presented in table 4 in terms of life-quality elements and their two subcategories.

Results of the χ^2 test are presented in Table 5. In the six analyzed elements of life quality, only subjective health condition and motor organ diseases were statistically significant in terms of sport performance in the past (Table 5). In the group of women doing sport in the past, a significantly higher percentage reported good health status. Moreover, motor organ diseases were correctly diagnosed in significantly more of these women than the control group.

Risk of osteoarticular and/or muscle disorders in the formerly physically active women examined with the odds ratio computed for motor organ diseases (OR=3.95) was 4-fold higher than the control women.

The significance and strength of correlations between the analyzed categorical variables are presented in the statistics. However, they did not show any relationship between the selected categories of categorical variables. These values were then examined with multiple correspondence analysis.

TABLE 4
WOMEN PRACTICING (S) AND NON-PRACTICING (NS) SPORT IN THE PAST AND THEIR LIFE-QUALITY

Life Quality		S	NS
Health status	good	36 (73.47%)	23 (51.11%)
	bad	13 (26.53%)	22 (48.89%)
Osteoporosis	Osteopenia/ osteoporosis	41 (83.67%)	37 (82.22%)
	norm	8 (16.33%)	8 (17.78%)
Motor organ diseases	no	6 (12.24%)	16 (35.56%)
	yes	43 (87.76%)	29 (64.44%)
Cardiovascular diseases	no	14 (28.57%)	12 (26.67%)
	yes	35 (71.43%)	33 (73.33%)
Respiratory diseases	no	45 (91.84%)	40 (88.89%)
	yes	4 (8.16%)	5 (11.11%)
Depression	yes	46 (93.88%)	42 (93.33%)
	no	3 (6.12%)	3 (6.67%)

S – women who practiced sport in the past
NS – women who didn't practice sport in the past

Multiple correspondence analysis, similar to factor analysis, is used to present a large number of variables in the low-dimensional space describing its variability. Therefore, multidimensional geometric space was limited to the first two statistically significant eigenvalues. They correspond to the two dimensions represented graphically in Figure 1. Both values capture 42.31% of the total inertia, the first dimension - 22.74% and the second - 19.57% (Table 6). The result proves the first two dimensions are correct representations of primary data. Subsequent dimensions capture smaller parts of inertia and do not provide any new information.

The correlation (coexistence) between the selected variables is presented in Figure 1. Two groups of variables representing a category were on the first axis (blue line –the highest involvement in inertia showing the strongest discrimination of the coexistence of categories.

TABLE 5
RESULTS OF THE $\chi 2$ TEST ANALYSIS

	Health status		Osteoporosis		Motor organ diseases		Cardiovascular diseases		Respiratory diseases		Depression	
	$\chi 2$	p	$\chi 2$	p	$\chi 2$	p	$\chi 2$	p	$\chi 2$	p	$\chi 2$	p
Chi^2 Pearsona	5.02	0.03	0.03	0.85	7.11	0.01	0.04	0.84	0.24	0.63	0.01	0.91
Chi^2 NW	5.06	0.02	0.03	0.85	7.29	0.01	0.04	0.84	0.24	0.63	0.01	0.91
Chi^2 Yatesa	4.11	0.04	0.01	0.93	5.87	0.02	0.00	0.98	0.02	0.89	0.10	0.75
Chi^2 McNemara (A/D)	2.25	0.13	17.42	0.00	11.46	0.00	10.30	0.00	27.84	0.00	32.09	0.00
(B/C)	2.91	0.09	20.90	0.00	13.83	0.00	6.89	0.01	30.42	0.00	36.00	0.00
OR	0.38	0.89	0.90	2.65	3.95	11.30	0.91	2.25	0.71	2.83	0.91	4.77

One group strongly correlated with doing sport in the past, while the other correlated with not doing it.

TABLE 6
MULTIPLE CORRESPONDENCE ANALYSIS EIGENVALUES, TOTAL INERTIA AND VALUES OF $\chi 2$

Dimension	Eigenvalues	Inertia (%)	$\chi 2$
1	0.227432	22.74324	170.9601
2	0.195701	19.57012	147.1078
3	0.168306	16.83065	126.5153
4	0.140669	14.06694	105.7407
5	0.115495	11.54955	86.8175
6	0.083567	8.35673	62.8172
7	0.068828	6.88278	51.7376

The graph clearly presents a close correspondence between doing sport in the past and mineral bone density, good subjective health evaluation and motor organ diseases. Osteoporosis was more frequently observed in the non-active subjects.

The point representing depression was the most distant from the axis. This fact shows the lack of correlation between doing sport in the past and other elements of life quality. The Point health status: bad correlated strongly with non-active women and simultaneously was more distant from the points representing active and non-active women than the point health status: good. It presumably corresponded to the variable respiratory diseases which seemed to be a factor modifying the results observed. Respiratory disorders may have been significant in the subjective evaluation of poor health. While cardiovascular diseases located close to the inertia axis did not correlate with doing sport in the past.

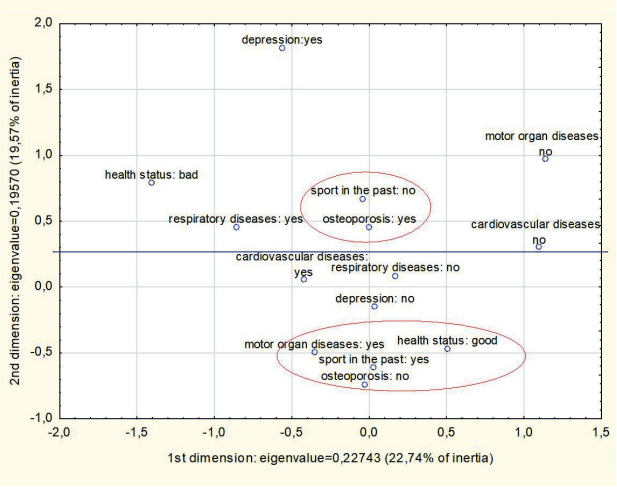

Fig. 1. Coexistence of the selected categories of analyzed factors.

Discussion

Regular sport activity is one of the important factors in disease prevention. As a result, changes occurring in the human body improve health, biological condition and endurance. Consequently, it leads to longer life expectancy and improvement of the quality of life. However, there are different barriers which prevent people from doing physical activity. They may be related to poor health status, financial situation, no companion or fear of injury[9,10].

Regularly performed physical activity improves health and is also highly beneficial in terms of mental health[11]. Kozak-Szkopek and Galus proved that mood improvement results from motor rehabilitation. Endorphins produced during physical activity have an impact on the decreased sensation of pain and trigger happiness. They improve falling asleep easily and subjective health evaluation[12]. Physical activity is one of the most efficient methods preventing depression. Numerous population studies of the elderly (in Greece, Italy and Brazil) showed that physical activity and healthy eating habits result in maintaining good physical and mental health being the most significant factors of successful aging[13,14]. As shown by American research conducted on 302 subjects (aged 70-80 years), the intensity of physical activity significantly correlates with a lower mortality rate. Therefore, the elderly can improve their life quality and expectancy by performing suitable physical activities[15]. Our study also confirmed that subjective health evaluation was better in women who were physically active in the past, regardless of current comorbidities.

Researchers report that regular physical activity at a young age leads to better health in the later years of life[16,17]. Burzycka and Rektor in their study showed consistent evidence in favor of a link between habits from youth in taking up physical activity to the elderly[18], while Maszczak reported the significant influence of the family environment and habits learned at home[19]. In a study conducted by Grzegorczyk et al., physical activity of the parents correlated in 63.8% of the subjects[20]. Authors of this research found that subjective health evaluation in the later years of life was better in women doing sport in the past. However, we did not show any positive or negative effects in the selected features of biological condition related to subjective health evaluation.

Overtraining is characterized by harmful changes in the skeletal system. Premature overtraining of a young body may cause accelerated ossification and bone overgrowth at muscle attachments leading to strong muscle growth in the transverse plane. Strength and endurance training started prematurely may provoke disc degeneration and deepening of physiological spinal curvature[21]. The negative, distant results of doing sport in the past on osteoarticular and muscular systems were also present in our research.

Regular and correctly performed physical activity prevents heart diseases, diabetes, falls and bone breaking. Moreover, it also improves sleep and life quality[22-24]. The beneficial influence of training is also observed in endur-

ance, dynamic balance and flexibility. Nevertheless, further study is required to analyze which of the programs is more efficient[25]. Noteworthy are the results of several studies confirming that regular physical activity enhances the motor fitness of the elderly women[26-29].

Conclusions

1. Physical activity performed in the past did not bring any distant (positive or negative) results in such features of biological condition as: body fat (level and distribution), bone mineral density and cardiovascular efficiency.
2. The approach to subjective health evaluation was much better in women who did sport in the past despite their significantly higher prevalence of motor organ diseases. Osteoarticular and muscle disorders may be the negative results of sport performance in the past.
3. The correlation found between the values of osteoporosis and doing sport in the past (no direct correlation) seems to have modified correlations between other variables.
4. Depression did not correlate with any other variables.
5. Poor subjective health evaluation was presumable due to respiratory disorders.

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BAVLJENJE SPORTOM I NEKA BIOLOŠKA OBILJEŽJA KVALITETE ŽIVOTA U ŽENA IZNAD 55 GODINA

S A Ž E T A K

Starenje populacije je karakteristično za 21. stoljeće, a smatra se da fizičke vježbe, uz pravilno izvođenje, mogu značajno utjecati na proces starenja i znatno smanjiti pogoršanje psihofizičkog stanja. Cilj ovog istraživanja bio je provjeriti, ako (i kako) bavljenje sportom u mladosti utječe na fizičku sposobnost i kvalitetu života žena u odrasloj i starijoj dobi. U istraživanje su bile uključene 94 žene, koje su izjavile da prakticiraju ili su prakticirale fizički aktivan stil života (49 žene su se bavile sportom u prošlosti, dok njih 45 nisu bile fizički aktivne u mladosti). Fizička sposobnost kao posljedica nekadašnje sportske aktivnosti analizirana je uz pomoć testa Rikli i Jones. Značajno bolje rezultate u testu sagibanja prema naprijed i hodanja pokazala je skupina žena koje su se nekad aktivno bavile sportom. Utvrđena je bliska povezanost između bavljenja sportom u prošlosti i mineralne gustoće kostiju, subjektivne procjene zdravstvenog statusa i bolesti motoročkih organa. Subjektivna procjena zdravlja je bila puno bolja u žena koje su se bavile sportom u prošlosti, unatoč njihovoj znatno većoj sklonosti bolestima motoričkih organa. Osteoartikularni i mišićni poremećaji mogu biti negativni rezultati bavljenja sportom u prošlosti.