

COMPARATIVE ANALYSIS OF THE PHYSICAL HEALTH OF WOMEN AGED 41-45 WITH RISK FACTORS FOR THE DEVELOPMENT OF CARDIOVASCULAR DISEASES

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Abstract. Identifying risk factors for cardiovascular disease and introducing adaptive games into the process of restoring motor activity contributes to improving the physical condition of women in the second period of middle age.

Purpose. To assess the impact of adaptive sports games on the physical health of women aged 41-45 for the further development of a concept of physical culture and sports rehabilitation for women in the second period of middle age with risk factors for cardiovascular disease.

Materials & Methods. Thirty-one women aged 41-45 participated in the study. Rehabilitation with women lasted 3 months at the Women's Health School. Through communication in messengers, WSG trainers and instructors prepared women for adaptive games competitions. Physical health was assessed using a test developed by O. Pirogova and co-authors.

Results. The women were divided into a main group (MG, n=15) and a control group (CG, n=16). At the Women's Health School, they participated in a proprietary corrective and preventive program. The normative component of the program for women in the EG and CG was the same: post-isometric relaxation, kinesiotherapy, and myofascial release. The variable component for the EG was adaptive games. A psychologist worked with the women on self-training using the Shulz method. The women in the CG engaged in training walks and individual training sessions with a psychologist. To assess changes in the level of physical health in women aged 41-45, the dynamics of hemodynamic indicators were studied, based on which physical condition indices were calculated using the O. Pirogova test. In women in the experimental group, all indicators improved significantly ($p<0.05$), while no statistical changes were observed in women in the control group. A comparative analysis showed that there are grounds to expect a reduction in the load on the cardiovascular system, an improvement in its regulatory mechanisms, and an increase in the overall physical condition of women aged 41-45 in the experimental group.

Conclusions. After completing the program, 80% of the participants in the main group and 12.5% of the women in the control group showed an increase in the physical condition index according to the O. Pirogova test. That is, adaptive movement games are an effective means of preventing the risk of developing cardiovascular diseases in women in the second period of middle age.

Introduction.

According to WHO data, in Europe and America, just like in Ukraine, cardiovascular diseases (CVD), disability and mortality from them occupy leading positions. Today, the population of our country has significantly decreased; according to scientists, the population of Ukraine will decrease by approximately 10 million in the next 20 years [1, 2, 3, 4].

EuroHeart (European Heart Health Strategy) insists that women are less likely to be given advice on CVD prevention than men; scientific research on CVD risk prevention in women in their second half of life is under-represented in the current literature [5, 6, 7, 8, 9], Identification of risk factors, development of corrective and preventive programs using physical education and sports rehabilitation is also important for women aged 41-45.[10, 11, 12, 13, 14].

It is a well-known fact that physical activity is aimed at supporting physical and mental health, contributing to the socialization of people of all ages [15, 16, 17]. Adaptive sports games as a tool of physical activity provide an opportunity (regardless of physical condition, age, health status) to be physically active, participate in social life, learn new things and, as a result, increase the quality of life and improve one's well-being [18, 19, 20].

To predict the level of physical health, O.Ya. Pirogova and co-authors proposed a regression equation. It can be assumed that the most significant ones were identified criteria such as height, weight, age, resting heart rate, and mean blood pressure in women 41-45 years old can form a basis for further development concepts of physical education and sports rehabilitation for women in the second period of adulthood with risk factors for developing CVD.

Purpose – assess the impact of adaptive sports games on level of physical health women 41-45 years old for further development concepts of physical education and sports rehabilitation for women in the second period of adulthood with risk factors for developing cardiovascular diseases.

Materials and methods of research

Participants

Using the example of the Academic Center for Sports and Recreational Games at the University of Economics in Bydgoszcz, Kuyavian-Pomeranian Voivodeship (Poland), the "Women's Health School" was organized at the MC "Profizio". Rehabilitation with women lasted 3 months under the supervision of specialists in physical education and sports rehabilitation. Through online communication on WhatsApp and Telegram messengers, WSG trainers and instructors taught women to play and prepared them for competitions in adaptive games Cornhole, Culbutto, Elastik (Le Passe-Trappe), Jacollo.

The study was attended by 31 women aged 41-45 years. All respondents were informed about the scientific study and provided written consent to participate in the study. Confidentiality of information about the participants was ensured by explaining that all data would be anonymous and would be used for research purposes. The study was conducted in accordance with all relevant national regulations and institutional policies, the principles of the Declaration of Helsinki adopted by the General Assembly of the World Medical Association (1964-2000), and the Council of Europe Convention on Human Rights and Biomedicine (1997).

Procedure

Definition the level of physical health was measured using a test O.Ya. Pirogova with co-authors, which proposed a regression equation that uses criteria such as height, body weight, age, resting heart rate, and mean blood pressure.

Formula:

$$P = \frac{700 - 3 \cdot \pi - 27 \cdot \text{сер} - 27 \times - 0,28 \text{ mila}}{350 - 2,6 \times \text{ik} + 0,21 \text{ picm}}$$

The level of physical condition (PCC) of health is assessed by a range of values from 0.375 and below (low) to 0.826 and above (high).

Statistical analysis. Statistical processing of the obtained results was carried out using the statistical package "Statistica 13.0"; descriptive statistics were obtained, which included the calculation of the arithmetic mean (M), standard deviation (s), standard error of the mean (m), median (Me), minimum (min) and maximum values (max), as well as quartiles of the distributions (25%, 75%). To compare independent samples in the absence of normal distribution, U was used - the value of the Mann-

Whitney test; p - the level of significance of differences. ; the level of significance of differences was determined by the following critical values: Ukp (36; 43; 0.05) = 606; Ukp(36;43; 0.01)=517.

Results. Women aged 41–45 years (n=31) were divided into the main (OB, n=15) and control groups (CG, n=16). All participants had signs of modified risk factors for cardiovascular disease (CVD) identified during screening. At the "School of Women's Health" they studied according to the author's correctional and preventive program, and the implementation of all components of the program was monitored by a specialist in physical education and sports rehabilitation.

The normative component of the program for women in the OG and CG was the same: in the morning, women independently performed a complex postisometric relaxation exercises (PIR); three times a week at the Prophysio MC, a special set of gymnastic exercises aimed at stretching and strengthening the muscles of the trunk and limbs; exercises for the muscles that stabilize the spine; kMcGill exercise complex Flossing; women installed the Calorie Calculator app (<https://www.tablycjakalorijnosti.com.ua/retsepty>), with which you can equally effectively control calorie content and use tables of nutritional value of products. In the evening, the women independently performed exercises with special massage balls (myofascial release) (Table 1).

Table 1. Scheme of the corrective and preventive program "Women's Health Schools"

Program components		Regimen, dosage	Women 41–45 years old (n=31)	
			Women OG (n=15)	Women CG (n=16)
normative	Postisometric relaxation	every day in the morning for 10-15 minutes.	+	+
	Kinesiotherapy at the Prophysio MC	Tuesday, Thursday, Saturday, 45 – 60 min	+	+
	Balanced diet	Calorie calculator 4 times a day	+	+
	Myofascial release	every day, in the evening for 10-15 minutes.	+	+
variable	Walking 6-8 km	Monday, Wednesday, Friday, 45 – 60 min	-	+
	Adaptive games	Tuesday, Thursday, Saturday after training 20 min.	+	-
	Schultz Method		+	-
	Individual sessions with a psychologist (conversations, art therapy)		-	+

The women chose the variable component at their own discretion. For the OG, it was proposed three times a week at the MC "Profizio" to play adaptive games such as Cornhole, Culbutto, Elastik (Le Passe-Trappe), Jacollo. The psychologist and the women engaged in auto-training according to the Schultz method. The women of the CG engaged in training walking three times a week. The psychologist conducted individual trainings.

To assess changes in the level of physical health in women aged 41–45 years in the main and control groups, the dynamics of heart rate, ATS and ATD were analyzed, from which physical condition indices were further calculated using the Pirogov method (Table 2).

Table 2. Dynamics of hemodynamic parameters in women aged 41-45 from the main (n=15) and control (n=16) groups during the experiment

Testing time	Statistical indicators	Hemodynamic indicators					
		Main group			Control group		
		Heart rate, beats/min	ATC, mm Hg.	ATD, mm Hg.	Heart rate, beats/min	ATC, mm Hg.	ATD, mm Hg.
Before the experiment	M	74.47	134.00	79.33	77.63	132.19	75
	s	6.16	5.73	4.95	6.12	7.95	9.49
	min	67	120	70	65	115	55
	max	90	140	85	86	145	90
	25%	70	130	75	74	126.25	66.25
	Me	74	135	80	78.5	135	75
	75%	78	140	85	82	138.75	83.75
After the experiment	M	69.93	122.67	72	77.63	130	75.63
	s	3.92	5.63	4.14	6.12	5.16	9.29
	min	65	110	65	65	120	55
	max	80	130	80	86	135	90
	25%	68	120	70	74	126.25	67.5
	Me	70	125	70	78.5	130	75
	75%	72	125	75	82	135	83.75
Reliability of changes	t	2,516	-	-	-	-	1,464
	Z	-	-3.066	-2,898	-	-1.823	-
	p	p<0.05	p<0.01	p<0.01	-	p>0.05	p>0.05

In women of the OG group, after the implementation of the author's program with the addition of adaptive games, the average value of the heart rate decreased. In addition, the fluctuations of these indicators (s) decreased, which indicated the stabilization of hemodynamics in conditions of functional rest. Such changes are signs of an increase in the general level of physical condition, and therefore a decrease in the risk of developing cardiovascular diseases. In contrast, no major changes were recorded in women of the CG group. The average value of the heart rate remained unchanged, while high individual fluctuations remained, which indicated the instability of the reactions of the cardiovascular system. In general, the results obtained indicated a pronounced positive effect of the author's program of physical culture and sports rehabilitation on hemodynamic indicators, which, in combination with other effects, contributed to the improvement of the level of physical condition of women participating in its testing

After applying the appropriate statistical criteria, it was found that in women of the OG, statistically significant changes in all three hemodynamic indicators were observed. Heart rate decreased significantly ($p<0.05$), which indicates an improvement

in the adaptive capabilities of the cardiovascular system at rest. ATS also decreased significantly ($p<0.01$), as did ATD ($p<0.01$). Such positive dynamics indicated the effectiveness of the implemented author's correctional and rehabilitation program and its impact on the normalization of hemodynamics. In women of the CG, statistically significant changes in hemodynamic indicators were not detected, which further confirmed the insufficient impact of the traditional program on the functional state of the cardiovascular system.

Thus, the comparative analysis showed that there are reasons to expect a decrease in the load on the cardiovascular system, an improvement in its regulatory mechanisms, and an increase in the overall level of physical condition of women aged 41-45 years in the OG.

Conducting the Pirogova O. test allowed us to identify changes in the level of physical health under the conditions of implementing the developed alternative program (Fig. 1 and Table 3).

The results showed that before the experiment began, most of the OG calculation results ranged from below average to average. One woman's score was on the verge of low physical condition.

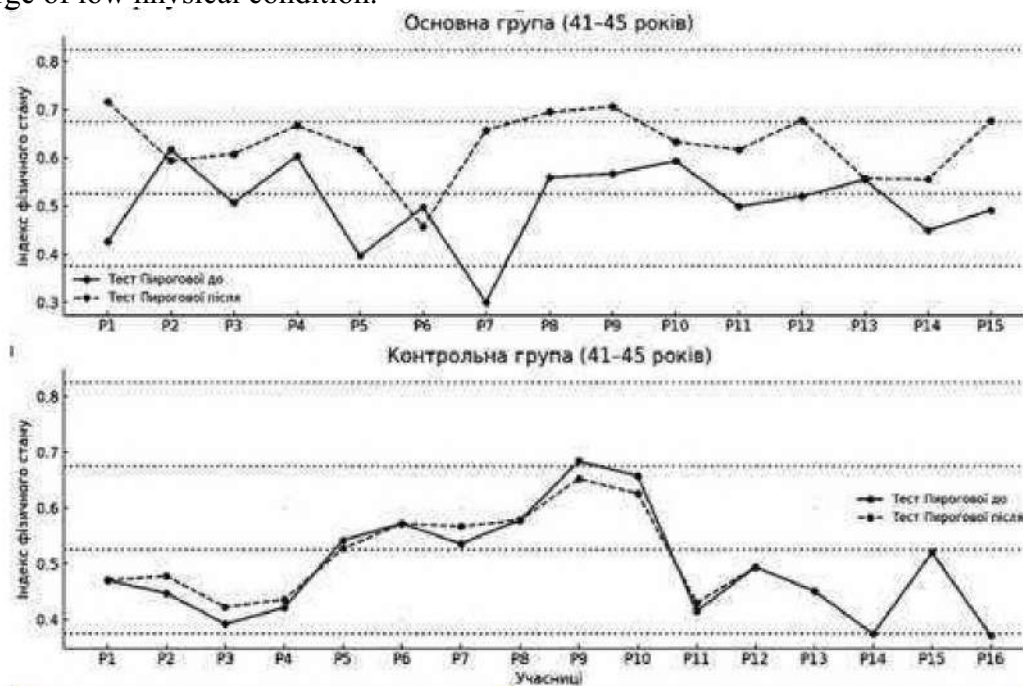


Fig. 1. Physical health indicators women aged 41-45 from the main ($n=15$) and control ($n=16$) groups according to the Pirogov test O. Ya. before and after the experiment, where the solid line is before the experiment, the dotted line is after the experiment, the horizontal lines indicate the upper limits of the levels of physical condition, the symbols Pn are the code of the study participant

After completing the program, 80% of the OG participants showed an increase in the physical condition index. The values ranged from 0.457 to 0.716. This indicated an improvement in the functional state of the cardiovascular system and stabilization of hemodynamic parameters.

In the CG, the values of the physical condition index remained almost unchanged. All women maintained their indicators within the lower than average and average levels, and in two participants after the experiment the index remained below the norm, which indicated the lack of effective dynamics. In 12.5% of women, a slight improvement in the index was observed.

Table 3 shows a comparison of the distribution of physical condition levels of women aged 41-45 years based on the Pirogova O.Ya. test before and after the implementation of the rehabilitation program.

Here we see that before the experiment, only 40% of the OG women had an average level of physical condition, while 53.3% were below average, and 6.7% demonstrated a low level (<0.375). After completing the program, a significant positive change occurred. 60% of the women reached an average level, another 33.3% - above average, and the proportion with indicators below average decreased to 6.7%. None of the participants had a low physical condition after the experiment. That is, the proportion of women who were in the average or above average zone increased from 40% to 93.3%, which indicated a pronounced improvement in the functional state of the body under the influence of the program.

Table 3. Comparison of physical health indicators according to the O. Pirogova test in %in women aged 41-45 from the main (n=15) and control (n=16) groups before and after the experiment

Physical condition level	Value range	OG(n=15)		KG(n=16)	
		To exp., %	After exposure, %	To exp., %	After exposure, %
Low	0.375 and less	6.7	-	12.5	12.5
Below average	0.376-0.525	53.3	6.7	50	50
Average	0.526-0.675	40	60	31.2	37.5
Above average	0.676-0.825	-	33.3	6.3	-

In contrast, in the control group, the dynamics were minimal. The indicator of low physical condition remained unchanged (12.5% before and after), as did the proportion of women with a level below average (50%). A slight increase was recorded in the average level zone - from 31.2% to 37.5%, however, the proportion of women who had a level above average before the experiment (6.3%) disappeared after the implementation of the program. That is, we have a lack of progress, and even a partial deterioration of the results in some participants.

According to such data, the author's rehabilitation program demonstrated a positive effect, while traditional technology did not provide the necessary improvement in physical condition in women with risk factors for the development of cardiovascular diseases.

The application of the Kolmogorov-Smirnov and Shapiro-Wilk criteria showed that the values of the Pirogova test before and after the experiment in both groups were normally distributed, and therefore the reliability of the changes was assessed by the t-test. Moving on to assessing the reliability of the changes in this indicator in the groups, let us pay attention to the mean values and standard deviations (Table 4).

Table 4. Dynamics of physical health indicators in women aged 41-45 from the main (n=15) and control (n=16) groups during the experiment

Statistical indicators							
Testing time	M	s	25%	Me	75%	t	p
Main group							
Before the expo.	0.505	0.086	0.449	0.506	0.567	4,331	p<0.001
After the exp.	0.629	0.069	0.594	0.633	0.678		
Control group							
Before the expo.	0.495	0.095	0.417	0.482	0.565	0.582	p>0.05
After the exp.	0.498	0.085	0.432	0.486	0.571		

In OG women, after the end of the experiment, the mean value increased from 0.505 to 0.629 (by 0.124 points or 24.52%), which was accompanied by an increase in the median from 0.506 to 0.633, as well as a shift in the upper quartile from 0.567 to 0.678. It was statistically significant ($p<0.001$) and confirmed the real improvement in the physical condition of women as a result of the implementation of the rehabilitation program. A decrease in the dispersion of values (s) from 0.086 to 0.069 indicated greater homogeneity of the response among the participants.

In contrast, in the CG, the mean value practically did not change (it was 0.495 ± 0.095 , and became 0.498 ± 0.085), while the t-test showed the absence of statistically significant changes ($p>0.05$). A slight increase in the median (from 0.482 to 0.486) and unexpressed changes in quartiles indicated the absence of significant dynamics in the physical condition of women undergoing rehabilitation according to the traditional program.

Therefore, the results of statistical analysis confirmed the effectiveness of the impact of the correctional and preventive program with the addition of adaptive games on improving the level of physical condition of women in the second period of mature age.

Discussion. Prevention of cardiovascular diseases is not just a medical recommendation, but a vital necessity. Statistics show that 80% of premature heart attacks and strokes can be prevented through lifestyle changes and control of risk factors [3, 5, 14]. The scientific community insists on The results of the study confirmed the work of scientists on the need for corrective and preventive programs to restore the functional state of the cardiovascular system of women in the second period of adulthood [13, 15, 17]. Opening the "School of Women's Health" in communities and training according to the programs will allow them to adjust their lifestyle, restore the neuro-emotional state of women, and optimize physical and motor activity.

Adaptive games and preparation for competitions have a training effect on the body of women. In addition, they have a positive effect on the nervous system, physical, emotional and social health of women in the second period of adulthood [18–20]. The results of this study are confirmed by the positive dynamics of hemodynamic indicators.

As noted by Petruk I. et al., (2024) adaptive sports games can not only positively affect the quality of life, but also such functions as fine motor skills,

proprioception and balance [19], The results of women in the main group of our study confirmed the conclusions of scientists. Thanks to the introduction of adaptive games into the correctional and preventive program, the physical condition indicator according to the O.Ya. Pirogova test significantly increased in women.

Skaliy O. (2024) proved that engaging in adaptive games in Poland for the adult population (35-60 years old) had a positive effect on the manifestation of activity, improving mood and well-being [18]. That is, the use of adaptive games can be an effective prevention of age-related changes and psycho-emotional disorders.

Conclusions. The results obtained showed a significant positive effect of the author's program on hemodynamic indicators, which, in combination with other effects, contributed to the improvement of the level of physical condition of women. After completing the program, 80% of the participants of the main group and 12.5% of the women of the control group had an increase in the physical condition index according to the O.Ya. Pirogova test. Based on the above, we can conclude that adaptive outdoor games are an effective means of preventing the risk of developing cardiovascular diseases in women in the second period of adulthood. Further research is planned to determine the impact of adaptive games on the psychological state of women in the second period of adulthood.

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