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Efficiency of Application of Selection of Educational and Training Methods of Physical Preparation for Paralympic Athletes

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ABSTRACT
The aim of the study is to compare the effectiveness of using educational and training methods in the field of adaptive physical education and Paralympic sports in the practice of training handball players. Particular attention is paid to the results of using the set of exercises developed by the author based on the methodology of psychophysical training (based on the use of the psycho-emotional factor) in combination with the use of physical exercises from a wide range of classical and non-traditional training systems.

Keywords: adaptive physical education, paralympic sports, educational and training methods, psycho-emotional state

INTRODUCTION

The field of physical education and sports, research is constantly being conducted to improve and optimize the educational and training process, means and methods for improving the physical development and physical fitness of the widest range of the population.

In the field of adaptive physical education and paralympic sports (APES), the range of tasks has been expanded by adapting existing technologies and methods to their specifics. One of the primary tasks solved by the APES is the adaptation of approaches to scientific and methodological support of the training process (including high-performance sports) tested by world practice, taking into account the specific features of physical education and sports activities among people with disabilities. When adapting new physical education and sports technologies for APES, it is necessary to strive to ensure that the classes are interesting and attractive for those involved, contribute to their comprehensive development and improvement, which will lead to an increase in the effectiveness of the classes and the consolidation of the need for them [7].

The main goal of the activity in the APES: maximum development with the help of its means and methods of the viability of a person with disabilities, maintaining their optimal psychophysical state, giving each of them the opportunity to realize their creative potential and achieve outstanding results, not only comparable to the results of healthy people, but even exceeding them [3].

APES integrate three areas of knowledge: physical education, medicine and correctional pedagogy, including a large number of educational and scientific disciplines: theory and methodology of physical education and sports, physical training, motor recreation, physical rehabilitation, etc [7]. Therefore, an integrated approach is important, both to the training process and to the medical, biological and psychological support of people with disabilities, since only such an approach ensures the required effectiveness. When implementing an integrated approach, it is necessary to create a unified concept and integrate, in most cases, contradictory conclusions of individual sciences into a single logic of development and improvement of a person with disabilities.

In the field of physical culture and sports, in addition to traditional training methods, complex methods based on combining traditional exercises with exercises from various non-traditional systems of health gymnastics (such as aerobics, fitness, Pilates, breathing practices, stretching, yoga, etc.) have become widespread, the so-called mixed training [5]. Also, methods based on taking into account psychological and emotional factors are becoming widespread. They are based on methods of mental self-regulation, conscious management of the state of the whole organism, mood and emotions. Exercise complexes and methods for constructing such training are called psychophysical training (PPT) [8].

The application and adaptation of these methods is particularly promising in the field of adaptive physical education and Paralympic sports.

Aim of the study

Comparison of the effectiveness of the application of training methods in the field of APES in practice,

particular attention is paid to a set of exercises based on PPT methods, as a single system of selected physical loads in combination with mental self-regulation tools and conscious control of the state of the whole organism, mood and emotions.

Methods and organization of the research

Harmony of psycho-emotional and physical forces increases health reserves, creates conditions for creative self-expression and is not an accompanying factor, but a fundamental basis for the harmonious development and life of the individual [7]. Taking these connections into account, a group of researchers (M.R. Mogendovich, V. Meshka, I. Z. Velvovsky, K. Dineika and N. Narbut) created one of the first sets of exercises under the general name psychophysical training. "Psychophysical training is a method of self-influence on the body by changing muscle tone, regulated breathing, figurative representation of the normal functioning of organs, verbal reinforcement with the aim of increasing psychophysical potential, cultivating active attention, will, developing memory, forming self-control and an adequate response to stimuli" [8].

The leading principle of PPT is to take into account the unity of the physical (somatic) and mental. The psycho-emotional approach is based on taking into account the mutual influence of the performance of physical movements and the state of the central and autonomic nervous system. The most important factors of psychophysical training are the ability to regulate the process of breathing, muscle tone and psycho-emotional state.

Also widely used are complex methods that seek to combine the best of individual training systems by combining exercises from various such systems, the so-called mixed training.

Mixed training combines exercises from several disciplines: yoga, pilates, fitness and barre - and use them for a harmonious workout of the whole body. Mixed training is a complete program of exercises for the mind and body, providing comprehensive development of the mind and body, offering both physical and mental loads, which are balanced with rest and relaxation.

The peculiarity of this type of training is a large selection of consistently performed exercises that provide the body with a load, adapting to which it changes. Frequent changes in the types of exercises, their sequence and intensity of execution stimulate the body to change, improving the achieved results. Numerous studies have proven that regularly changing training programs makes the body adapt to new loads and helps to avoid stagnation in training.

There are three principles at the core of mixed training: correct body position, correct technique of performing movements and correct breathing. Using them in practice will allow you to get more benefit from performing each exercise.

Based on the principles of psychophysical training, expanded by means of mixed training, a technology was developed for the educational and training process of physical training of athletes with disabilities, registered under the name Extensive Physical Training (EPT) in the Agency for Intellectual Property under the Ministry of Justice of the Republic of Uzbekistan (a certificate was received). Based on this technology, an original set of physical exercises has been developed for the educational and training process of physical preparation of Paralympic athletes.

To experimentally substantiate the effectiveness of using a new set of exercises in the educational and training process of physical training of athletes with disabilities, a pedagogical experiment was conducted [10].

The experiment was conducted during classes in goalball training groups under the auspices of the Paralympic Association of the Republic of Uzbekistan. The Paralympians had deviations only in vision, the rest of their physical qualities were normal. The division of the contingent into an experimental and control group was carried out randomly, to ensure the equivalence of the groups before the start of classes. In the control group, classes were conducted according to a widespread and generally accepted training program.

The total number and total time of classes, intensity of physical activity during the pedagogical experiment in the experimental and control groups were almost the same. For the experimental group, a developed complex based on the improved technology of psychophysical training was used. In addition, for the experimental group, PM support was used to the maximum extent. In the control group, classes were conducted according to a widespread and generally accepted program of classes [10].

The research results were analyzed according to three conditional groups of indicators: physical development and health status, physical fitness and anthropometric indicators of those involved.

The study of the psycho-emotional state of the participants was conducted using a blank test questionnaire designed for the rapid assessment of well-being, activity and mood (WAM). The assessment was conducted for all group participants at the beginning and end of the pedagogical experiment.

Research results and their discussion

Analysis of the data on the dynamics of changes in physical development and health status showed that there was a reliable improvement in physical development, which is confirmed by statistically significant changes in the participants of the experimental group.

Table 1. Indicators of physical development and health status of athletes from the experimental and control groups in comparative dynamics of changes by the end of training

№	Indicators	Dynamics of changes in EG			Dynamics of changes in the CG		
		$\bar{x}$	t	P	$\bar{x}$	t	P
1	Height, (cm)	176,8	0,8	>0,05	176,1	0,6	>0,05
2	Body weight (kg)	70,4	0,5	>0,05	69,4	0,3	>0,05
3	Resting heart rate	75,2	2,9	<0,05	77	2,2	<0,05
4	BP mmHg Systolic	114,6	3,8	<0,05	117,1	2,3	<0,05
5	BP mmHg Diastolic	75	3,4	<0,05	77,1	2,3	<0,05
6	Dynamometry of the left hand	35,8	3,9	<0,05	33,3	2,4	<0,05
7	Dynamometry of the right hand	37	4	<0,05	34,6	2,6	<0,05
8	Stange test (sec)	55,6	4,1	<0,05	50,1	2,1	<0,05
9	Gench test (sec)	43,8	4,9	<0,05	38,3	3	<0,05
10	Orthostatic test (lying down)	70,9	2,8	<0,05	72,7	2,4	<0,05
11	Orthostatic test (standing)	80,7	4,5	<0,05	84,6	3,4	<0,05
12	Orthostatic test difference	9,8	7,8	<0,05	11,9	4,9	<0,05
13	Ruffier's Assay Index	5,8	4,7	<0,05	7,4	2,9	<0,05

Note: Abbreviations and designations in table columns: **EG** - experimental group; **CG** - control group;$\bar{x}$- average value; **t** - t- Student's t-test; **P** - significance level.

A decrease in resting heart rate from 79.7±3.9 to 75.2±3.7 (significance level P < 0.05) and blood pressure from 119.6±3.2 by 79.6±3.2 to 114.6±3.2 by 75.0±3.5 (P < 0.05), positive changes are also observed in the Stange test values from the initial value of 45.1±6.3 to 55.6±6.2 (P < 0.05) and the Gench test from 31.8±5.9 to 43.8±6.0 (P < 0.05).

Significant changes are observed in the dynamometry indices of the left hand from 30.2±3.5 to 35.8±3.5 (P<0.05) and the right hand from 31.2±3.6 to 37.0±4.0 (P<0.05), the difference in the orthostatic test from 15.8±1.9 to 9.8±1.8 (P<0.05) and the Ruffier test index from 8.9±1.6 to 5.8±1.6 (P<0.05).

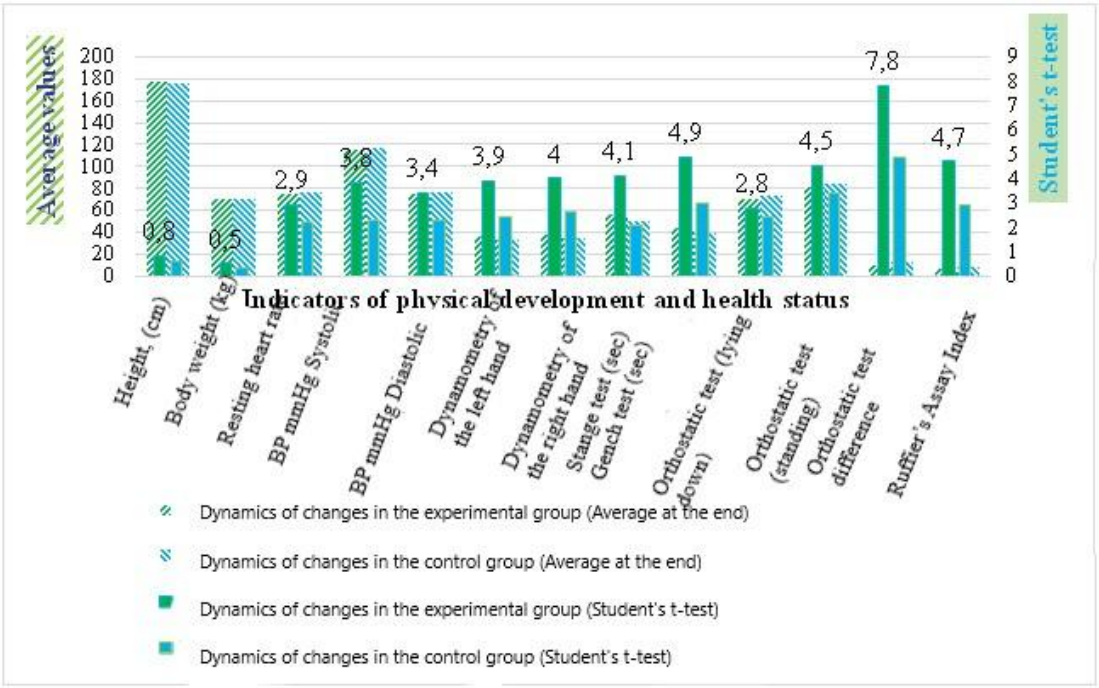

Fig. 1. Dynamics of changes in physical development indicators and health status

Comparison of the dynamics of changes in physical development indicators and health status separately for the experimental and control groups from the beginning of the classes to their end shows that there was a reliable improvement in physical development for most indicators in both groups. It can be noted that in general, the experimental group demonstrated better growth dynamics, especially for the indicators of the Stange test, the

Gench test, the difference in the orthostatic test and the Ruffier test index. This allows us to assume better development of the respiratory and cardiovascular systems in those involved in using the psychophysical training complex [10].
Analysis of data, changes in physical fitness indicators confirms statistically significant changes in participants of the experimental group.

Table 2. Physical fitness indicators from the experimental and control groups in comparative dynamics of changes by the end of classes.

№	Indicators	Dynamics of changes in EG			Dynamics of changes in the CG		
		$\bar{x}$	t	P	$\bar{x}$	t	P
1	Bending and unbending arms in a lying position	30,3	7,6	<0,05	26,9	4,4	<0,05
2	Raising the body from a lying position, hands behind the head	38	5,6	<0,05	33,8	2,7	<0,05
3	High Bar Pull-ups	11,2	4,3	<0,05	9,5	2,2	<0,05
4	Hanging Leg Raises	12,8	6,2	<0,05	10,9	3,4	<0,05
5	Double Leg Squat	55,3	6,6	<0,05	53,4	4,5	<0,05
6	Long jump from a place, (cm)	220,2	6,1	<0,05	214,1	4,7	<0,05
7	Long jump with a run-up, (cm)	299,5	3,9	<0,05	289,4	2,4	<0,05
8	100m dash (sec)	15,8	2,3	<0,05	16,1	2,1	<0,05
9	Forward bend, from a standing position on a gymnastic bench, below the bench level, (cm)	5,6	8,4	<0,05	3,5	4,4	<0,05

Note: Abbreviations and designations in the table columns: **EG** - experimental group; **CG** - control group;**$\bar{x}$**-average value; **t** - t-Student's criterion; **P** - significance level.

In terms of the indicator of flexion and extension of the arms in a prone position, a significant improvement in the results is observed: at the beginning of the experiment, athletes from the experimental group performed 21.9±2.6 times, and at the end - 30.3±2.8 times, ($P < 0.05$).
Similar changes are observed in other strength indicators, such as: lifting the body from a lying position, hands behind the head from 30.2±3.4 to 38.0±3.5 ($P < 0.05$), pull-ups on a high bar from 8.2±1.6 to 11.2±1.7 ($P < 0.05$), hanging leg raises from 8.6±1.7 to 12.8±1.7 ($P < 0.05$) and squats on two legs from 40.9±5.1 to 55.3±5.6 ($P < 0.05$).

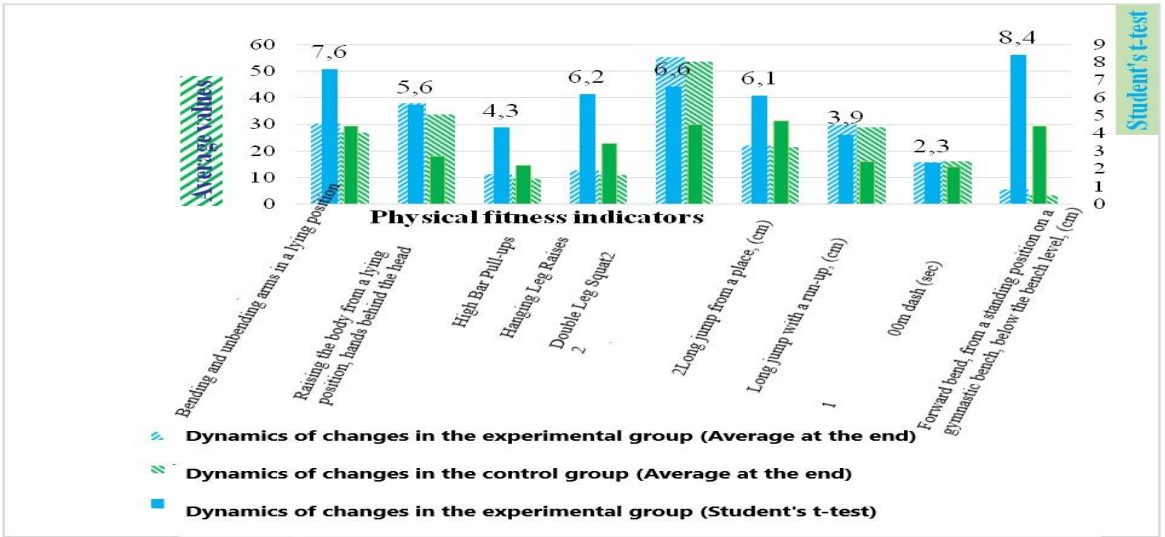

Fig 2. Dynamics of changes in physical fitness indicators

In tests characterizing speed-strength capabilities, reliable changes also occurred ($P<0.05$): standing long jump from 178.8±15.7 to 220.2±17.4, running long jump from 261.2±24.4 to 299.5±23.9, and 100 m run from 14.7±1.1 to 13.8±0.9.
The greatest changes occurred in the indicator characterizing the flexibility of the participants - forward bending, from a standing position on a gymnastic bench, below the bench level (cm). Thus, at the beginning of

the experiment, it was 1.4±1.2 cm in the experimental group, and by the end of the experiment it was 5.6±1.3 cm (P<0.05) [10].

Data analysis shows that there was a significant improvement in physical development in all indicators in both groups. The least significant difference is observed in the 100 m run indicator, which is associated with a lesser influence on this indicator of better development of general flexibility and strength indicators of the upper and middle parts of the body.

Table 3. Comparative dynamics of changes in anthropometric indicators

№	Indicators	Dynamics of changes in EG			Dynamics of changes in the CG		
		$\bar{x}$	t	P	$\bar{x}$	t	P
1	Neck circumference	38,3	0,2	>0,05	38,3	0,7	>0,05
2	Chest circumference, inhale	98,1	1,1	>0,05	97,4	1,0	>0,05
3	Chest circumference, exhale	91,0	0,7	>0,05	90,6	0,6	>0,05
4	Chest circumference, pause	93,3	1,0	>0,05	92,9	0,8	>0,05
5	Chest excursion	7,0	6,0	<0,05	6,8	4,0	<0,05
6	VC, (ml)	3861,5	6,5	<0,05	3708,3	4,1	<0,05
7	Right shoulder circumference, tense	32,9	2,6	<0,05	32,1	1,4	>0,05
8	Right shoulder circumference, at rest	30,0	2,3	<0,05	29,2	1,2	>0,05
9	Left shoulder circumference, tense	32,6	2,6	<0,05	31,8	1,5	>0,05
10	Left shoulder circumference, at rest	29,8	2,3	<0,05	29,0	1,2	>0,05
11	Waist circumference	78,2	0,4	>0,05	77,9	0,4	>0,05
12	Right thigh circumference	55,2	2,4	<0,05	55,3	2,5	<0,05
13	Left thigh circumference	55,0	2,3	<0,05	55,1	2,5	<0,05
14	Right calf circumference	37,0	0,7	>0,05	37,0	0,8	>0,05
15	Left calf circumference	37,0	0,7	>0,05	36,8	0,8	>0,05

Note: All circumferences were measured in cm.

Abbreviations and designations in the table columns: EG - experimental group; CG - control group; average value - $\bar{x}$; standard deviation - **σ** ; **t** - t-Student's criterion; **P** - significance level; pr. - right; lev. - left.

Analysis of the dynamics of changes in anthropometric indicators shows that there was a statistically significant improvement in anthropometric indicators not for all, but for several leading parameters.

There were no significant changes in the following parameters: neck circumference, chest circumference (inhale), chest circumference (exhale), chest circumference (pause), waist circumference and circumference of both shins (P> 0.05) although there are visible changes towards improvement in the development of the respiratory system. This was confirmed by the significant changes in such parameters as: chest excursion from 6.5±0.2 to 7.0±0.2 (P<0.05) and VC from 3515.4±128.1 to 3861.5±132.5 (P<0.05).

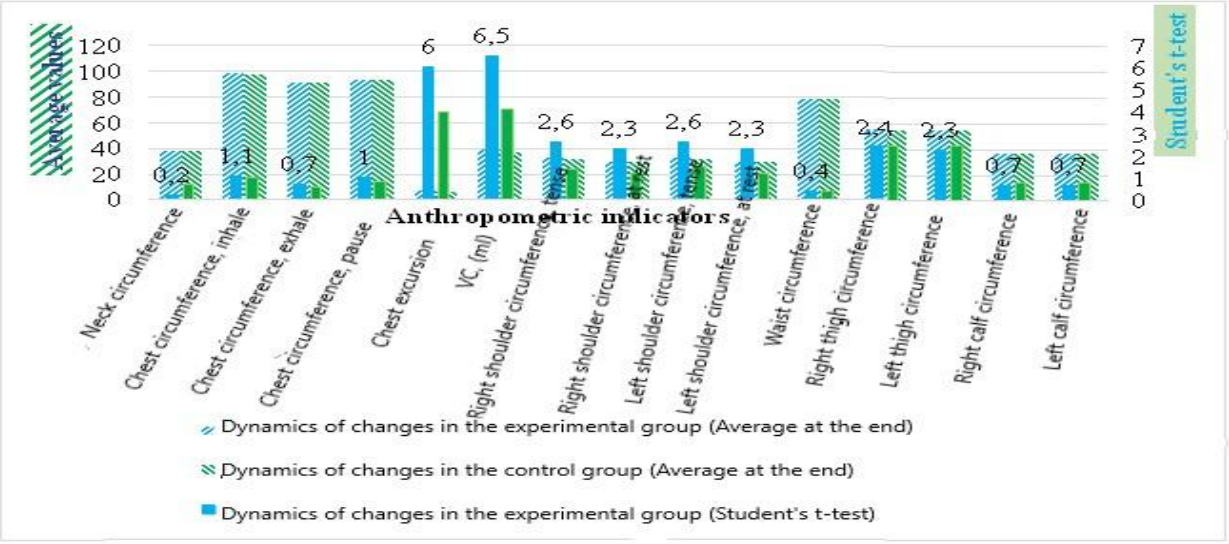

Fig 3. Dynamics of changes in anthropometric indicators

Also significant changes occurred accordingly in the parameters: right shoulder circumference (under tension) from 31.2±1.5 to 32.9±1.6 ($P < 0.05$), right shoulder circumference (at rest) from 28.5±1.6 to 30.0±1.6 ($P < 0.05$), left shoulder circumference (under tension) from 31.0±1.6 to 32.6±1.6 (significance level $P < 0.05$), left shoulder circumference (at rest) from 28.3±1.6 to 29.8±1.5 ($P < 0.05$), right thigh circumference from 53.6±1.7 to 55.2±1.7 ($P < 0.05$) and left thigh circumference from 53.4±1.7 to 55.0±1.7 ($P < 0.05$),

Data analysis shows that despite the general advantage in changes in the experimental group, compared to the control group, a statistically significant advantage in improving anthropometric indicators is observed only for the following indicators: chest excursion 7.0±0.2 versus 6.8±0.3 ($P < 0.05$) and VC 3861.5±132.5 versus 3708.3±131.1 ($P < 0.05$) [10].

As shown by the research of the psycho-emotional state of the trainees conducted according to the test questionnaire designed for the prompt assessment of well-being, activity and mood (WAM), the well-being of all trainees after the classes improved at a statistically significant level ($P < 0.05$). Thus, the average indicator for both groups before the classes was 4.1 points, and after the classes - 5.3 points and 4.7 points, for the experimental and control groups, respectively.

The improvement of all WAM indicators indicates not only a positive psycho-emotional state of those involved in the use of the developed set of exercises, but also a favorable effect of APC classes in general, since positive changes were observed in both groups.

However, it should be noted that the use of a set of exercises based on PPT leads to a more significant increase in the indicators of the psycho-emotional state. In percentage terms, the improvements were 129% in the experimental group, compared to 114% in the control group with a reliability of $P < 0.05$ [10].

Thus, the use of the developed methodology based on a complex of psychophysical training led to a noticeable increase in the indicators of physical development and health, physical fitness and anthropometry of athletes with disabilities.

The proposed method based on a complex of psychophysical training allows achieving better development of the cardiovascular and respiratory systems, overall flexibility and strength characteristics of the upper and middle parts of the body.

CONCLUSION

This paper examines the effectiveness of using various sets of exercises based on classical technologies and on a systemic approach, using the PPT methodology based on conscious, targeted regulation of the psycho-emotional state of athletes during training. The results of the pedagogical experiment indicate the prospects for using sets of exercises based on PPT.

The main factors influencing the effectiveness of using training loads in the developed methodology of physical education and sports classes for people with disabilities using exercises from various physical education systems were determined. The main criteria for selecting exercises corresponding to the goals and objectives of PPT were determined.

The effectiveness of a methodology based on a holistic, systemic approach and using mixed training technologies and PPT, ensuring the construction of exercise complexes that involve the psycho-emotional factor to optimize the educational and training process for people with disabilities, has been developed and substantiated.

Their overall effectiveness is confirmed and a comparison between these approaches is made. The special significance of the study is in studying the effectiveness of these technologies specifically in the field of adaptive physical education and Paralympic sports.

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