

Optimization of Physical Activities on Physical and Health Classes with Pupils

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Abstract—The significant deterioration in the physical fitness of modern schoolchildren, and as a result, the decrease in their level of health necessitates the improvement of the basic components of physical education system in educational institutions. One of the promising directions in this term is the use of a differentiated approach to the dosing of physical activity as an essential condition for the optimization of training process. This article highlights the content and results of practice-oriented research including the implementation of individualized planning of physical activity parameters for students on the basis of compliance with the physiological capabilities of organism in group training sessions with students of senior school age. The presented results of the correction of physical fitness of schoolchildren prove the effectiveness of the developed methodology and its health-related orientation, as evidenced by significant improvements in the indicators of the endurance control exercises which highly correlate with the health indicators.

Keywords—*physical education of schoolchildren. optimization of educational process. differentiation of physical load parameters*

I. INTRODUCTION

The health condition of younger generation is the most important indicator of social well-being, so the deterioration in physical fitness and student health indicators registered today creates the need to urgently improve the basic components of the physical education system in educational institutions. [1-7].

The use of modern tools and techniques including those the implementation of which makes it possible to combine mass organization of physical exercises with individually dosed physical activity for every student, helps to optimize the students' physical activity because with this approach it is based on matching the loads to the physiological capabilities of body [8-12].

This is very important because the unification of motion exercises in class makes them useless for some students (for physically strong students, insufficient loads do not cause stress on functional systems and do not entail the formation of a training effect) and damaging for physically weak students. Excessive loads in volume or intensity can cause the breakdown of adaptation mechanisms of cardiovascular system, which is especially dangerous when it comes to a growing organism in which many organs and functions are not yet fully formed.

Loads must be dosed so that their direction, content and intensity cause a significant strain on all organs and functional systems, and at the same time they must be feasible [13-16].

This article sums up the results of practice-oriented research which includes the development and implementation of grouped health-development techniques providing for the differentiation of physical activity in accordance with the current state and level of physical fitness of students of senior school age.

II. METHODS

The following methods were used to solve the problems of the research: theoretical analysis and synthesis of literature sources, questioning of schoolchildren, pedagogical experiment, pedagogical observation, testing of general physical fitness, methods of mathematical statistics.

The questionnaire survey was carried out to identify the level of motivation of 15-17 year-old school students to exercises.

The assessment of the general physical fitness of senior school age students was carried out with the aim of determining the initial level of individual indicators and for optimal planning of physical activity for the period of the experiment. Testing of preparedness was conducted in the form of competitions, and the results were evaluated according to standards for respective ages.

For high-speed abilities assessment 100 meter distance running was used. Endurance was estimated on the basis of the results of 2000 meter running (for girls) and 3000 meter running (for boys). The following tests were used to determine the muscle strength and power endurance of schoolchildren: pulling from a high-mounted cross (boys), bending and extending arms in rest position from gymnastics bench (girl); raising and lowering bodies from a prone position. Flexibility was assessed by the maximum amplitude of movement when leaning forward from a sitting position.

The method of pedagogical experiment resulted in the creation of 2 groups of schoolchildren – the experimental one (for practicing innovative methods) and the control one consisting of students engaged in the traditional system of physical education which does not imply the differentiation of physical activity.

III. RESULTS

Students' questionnaire of 8-10 classes showed low overall motivation of schoolchildren for sports activities - only 14% of the respondents were engaged in sports schools, clubs and

school sport sections; only 11% only sometimes exercised independently, and only 31% attended school classes of physical training (in most cases in order to get marks for the discipline).

The reasons for low interest of schoolchildren in active physical exercises are partly in family standards (only 8% indicated continuity of sports activities in family), the lack of knowledge in this subject area (only 17% of high school students are interested in modern sports and fitness technologies), and also in the assertion of schoolchildren that with the existing organization of educational process and its material support, physical training classes are not capable to significantly influence physical development and building technical skills in various sports [13].

The results of the initial control and educational tests in both groups showed that the majority of the students of 8th-10th grades (39.1% of 297) have a low level of general physical fitness and an average mark below 3. Three indicators contributed negatively to their overall assessment – indicators of muscle strength, flexibility and endurance. The results of performance of pupils of 8th-10th grades of standard general physical readiness are presented in table 1.

TABLE I. RESULTS OF PUPILS OF 8TH-10TH GRADES OF STANDARD GENERAL PHYSICAL READINESS (ON A SCALE FROM ONE TO FIVE)

Grades	Average mark of performance of pupils of 8 th -10 th grades of standard general physical readiness							
	Speed		Flexibility		Muscle strength		Endurance	
	girls	boys	girls	boys	girls	boys	girls	boys
8	3.8	4.2	3.2	3.6	2.8	3.8	3.3	3.5
9	4.0	4.1	2.9	3.4	2.7	3.4	3.0	3.6
10	4.1	4.1	3.4	3.2	3.0	3.7	3.2	3.6
Total	4.1		3.3		3.2		3.4	

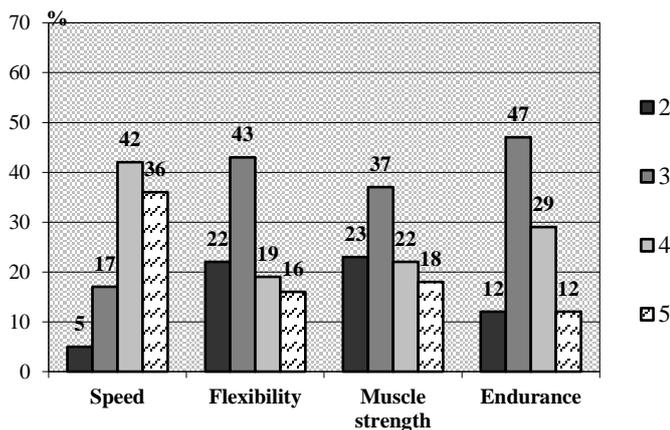


Fig.1. Results of control exercises performed by the students of the 10th grade on a scale from one to five, %

Fig. 1 clearly shows the percentage of results of control exercises performed by the students of the 10th grade on a scale from one to five. A similar picture is given by the analysis of similar indicators for students of 8th and 9th grades.

6% to 21% of tested students do not fit into age standards (i.e. they have 2 points) in different exercises, which confirms the need for multidirectional correction of physical condition of

students, since each of them has different indicators reduced to varying degrees.

The essence of the innovation technique is as follows: the main part of the training class is divided into 2 parts where the first part provides strength training and the second one provides the development of general endurance.

During the classes schoolchildren of the experimental group, according to the curriculum, as part of strength training, improved the technique of exercises on strength simulators and exercises with free weights, mastered load planning techniques depending on the level of preparedness and personal tasks (determined the number of sets, the number of repetitions in each set, intervals of rest, weight burdens in % of the maximum). According to the instructions of a teacher they performed exercises aimed at developing the strength of individual muscle groups (trunk, abdominals, shoulders, arms and legs biceps and triceps) using exercise machines, dumbbells, weights, bar disks, expanders, rubber bands, gymnastic and stuffed balls.

In addition in this part of a class, individualized preparation of students for the implementation of standards of general physical fitness was implemented. The differentiation of loads consisted in calculating and further performing by all students involved in their own monthly norm of training load which depended on the results of performing the corresponding exercises shown by them on preliminary testing (for boys - pull-ups, for girls - push-ups). That is, the maximum individual initial level of the development of strength in control exercises is taken as the basis.

On the basis of this method the monthly volume is calculated from the individual result by 1900% (this value is used in many types of sports training at the initial and training stages). Then the calculated monthly volume is divided into 4 weeks in the following percentage: 15% of the calculated amount falls within the 1st week 1, the 2nd week takes 28%, and the 3rd week takes 22%, and the 4th week takes 35% (thus taking into account the specific principle of physical education - waveform loads).

For example: a student of the 10th grade performs 8 pull-ups from hanging on a high bar (which is estimated at 3 points). To improve this result, he trains according to the proposed method calculating the monthly volume based on the initial level: 1900% from 8 times is 152 times. Consequently, in the 1st week, he must perform 23 pull-ups in class (which is 15% of 152 times); at the 2nd - 43 times (28%); at the 3rd - 33 times (22%); at the 4th week - 53 times (35%).

Further, the calculated amount of exercises is divided into 3 classes per week. Thus, in this example, a student at the 4th should perform an exercise 17-18 times in each class; he can do this in 2 or 3 sets with intervals for the rest. For example, in the first approach - 8 repetitions, in the second one - 6, in the third one - 4, it is possible to break the total number of exercises in different ways.

At the end of the month, re-testing of the strength development level of this exercise is carried out, and for the next month the amount of load is calculated based on the new result.

The experimental techniques provides the implementation of such methodological principles of physical education as waviness (the alternation of large, medium and small volumes of loads in weekly cycles), gradualness (which is realized in the volume gradual increase from month to month, subject to growth of results), individualization (all loads are calculated strictly based on their individual indicators), cyclicity (cycles are repeated every month).

For those students who were not able to perform the control exercise even once or did it for 2 points, the initial level was calculated based on the result of this exercise performed under light conditions - push-ups for girls, in this case, one can use the exercise not from the floor but from the gymnastic bench, or push-ups can be carried out in the support lying on knees; for boys, pull-ups can be performed from hanging on a low crossbar (legs touch the floor), etc. For them, the monthly value is calculated based on this result and later (subject to the result improvement) already on the number of exercises performed in standard for all conditions.

As a preparatory exercise to improve performance, for example, push-ups, one can use bending and unbending of arms while lying on knees; the same with wide or narrow hands; semi-bending - semi-unbending of arms from different positions; exercises performed from support (bench, low crossbar); push-ups made from back sitting; static exercises in a prone position (including stops on bent arms and forearms, backs on forearms behind, stops on one hand alternately) and static-dynamic exercises that combine keeping body position in a stance and performing bending and unbending of arms.

Since the result in push-ups depends not only on the strength of arm muscles, developmental exercises are also provided for other muscles involved in movement (for example, pull-ups on a low crossbar from a hanging position with a direct and reverse grip; bending and unbending of body from a supine position; hyperextension (body extension in support lying on hips), etc.

Similar exercise sets are provided for the development of muscles involved in pulling. In this case, as a preparatory exercise, one can use pull-ups from hanging up or even from hanging on a low crossbar, pulling up with a reverse or wide grip, etc.

A teacher must strictly control the correctness of techniques and the amplitude of exercises.

The second half of the main part of the class is devoted to the development of endurance as a leading quality in health promotion.

In the first (out of three) weekly training session, this time is set aside for aerobic exercise, i.e. for the development of general endurance. For this purpose, sports are used with an intense physical load (football, badminton, and basketball), relay races with elements of gymnastic exercises (somersaults, rolls, etc.), outdoor games with technical elements of team sports (dribbling, throws and passing a ball in basketball, exercises with badminton shuttlecock, etc.).

During the second weekly training session, students are engaged in the development of strength endurance using the circuit training method. They use sets consisting of 6-8

exercises that are performed at an average pace, 10-20 repetitions in each set.

In the third weekly training session, there is a 12-minute outdoor running at school ground. In some cases, for the development of speed endurance students can use jumping rope exercises performed in several sets.

Differentiation of physical activity in this part of the training session is realized in the individual pace of exercises, i.e. in running speed, number of repetitions per unit of time, and also in the amount of weights of strength exercises.

In this part of a class a teacher should keep a special strict control on the pulse load of students having hypersthenic type of body (overweight), since exercises necessary for them in class should cause increased energy expenditure and enable the activity of circulatory and respiratory systems (i.e. aerobic exercise) but at the same time excessive loads should not cause them to disrupt the adaptation mechanisms of cardiovascular system.

This technique does not exclude the development of other physical qualities. Exercises on the speed of motion actions can be applied at the end of the preparatory part of classes in the form of various running tasks with accelerations or exercises with an increased rate of movement.

Exercises aimed at the development of active flexibility are provided in the preparatory part of a class, and exercises aimed at the development of passive flexibility are used in the final part when muscle exhaustion occurs and they are less resistant to externally applied forces.

The development of movement and coordination abilities is provided in the process of the student play activity (in changing conditions, when opponents resist) and when performing new ones including strength exercises where it is required to balance the movements in spatial, temporal and strength parameters, to perform them from different starting positions as well as coordinate movements with different parts of body.

IV. DISCUSSION

The changes in the individual characteristics of physical fitness of students in both groups that occurred during the experiment period are uneven.

The speed rates changed slightly in both experimental and control groups. This is due to the fact that the sensitive age period for the development of this physical quality by the age of 15 is almost complete, and during training sessions the improvement of this physical ability is also limited by the conditions of a gym. In 100m race, students of the control group who improved their score by at least 1 point amounted to 11%, while in the experimental group only 8% of students had an improvement.

Flexibility indicators, on the contrary, changed significantly in both groups almost equally - the average rating of girls of the experimental group increased by 18.2%, of the control group - by 19.1%; regarding the boys, positive changes were 7.9% of the experimental group and 6.2% of the control group. However, the number of students of the experimental group

who improved their result was 72%, and those of the control group (for comparison) showed the improvement in the “lean from sitting” test only in 56% of the tested.

As for the control endurance exercise, the difference in the number of students who improved their results was insignificant in the experimental and control groups - 18% and 15%, respectively, but the endurance indicators of the experimental group of girls increased by 6.1%, of boys - by 5.0%, on the average, and the indicators of the control group of boys and girls increased only by 3.2%.

The students of the experimental group performed much better with the power standard - 44% were able to improve their results. In the control group, only 17% of schoolchildren showed the improvement of the result in “pulling up” and “push-ups” exercises. The girls of the experimental group improved their strength indicators by 15.8% on the average, and the boys - by 7.1%, as for the control group the improvement was made by 4.0% and by 3.3% respectively.

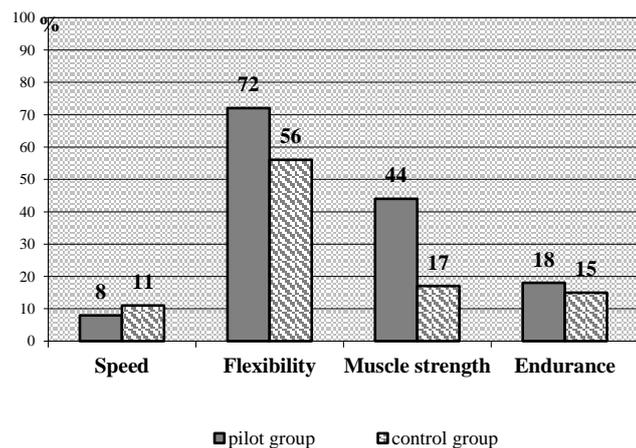


Fig.2. Percentage of schoolchildren in the experimental and control groups who improved (at least by 1 point) their results in control exercises after the completion of the experiment.

Fig. 2 clearly demonstrates the percentage of schoolchildren in the experimental and control groups who improved (at least by 1 point) their results in control exercises after the completion of the experiment.

V. CONCLUSION

The results of the research complement the scientific data on the possibilities and pedagogical conditions of implementation in group classes of a differentiated approach to the dosing of physical loads, the parameters of which are set in accordance with the current state of students.

The presented results of the pedagogical experiment consisting in optimizing the physical education of students of senior school age on the basis of individualization of physical activity allow stating that the innovative teaching techniques is health-developing (taking into account all the results, and especially in the exercise of endurance, highly correlated with health indicators).

In addition it is necessary to note that the involvement of students in independent calculations of their own workloads

increased their interest in the implementation of individual programs; contributed to the education of students of a conscious attitude to physical exercise and the formation of sustainable motivation; gradual improvement of personal results increased activity in class and interest in even greater results; as well as contributed to the expansion of horizons in this subject area.

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