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TÍTULO: Dinámica semanal del desempeño de la tarea de los alumnos de primaria en el modo motor avanzado.

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RESUMEN: Los resultados del estudio de la dinámica semanal del desempeño de las tareas de los alumnos de 4º grado indican que la introducción de clases adicionales de baile, que aumentan la cantidad de actividad física, contribuye a la formación de una mejor adaptación de los alumnos al estudio, aunque al mismo tiempo El desarrollo de la fatiga durante la semana escolar no se mitiga por completo, pero se reduce hasta cierto punto.

PALABRAS CLAVES: desempeño de tareas, modo motor avanzado, niveles de desempeño, niños en edad escolar primaria, ecología.

TITLE: Weekly dynamics of primary schoolers' task performance in the Advanced Motor Mode.

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ABSTRACT: The results of the study of weekly dynamics of task performance of 4th grade schoolers indicate that the introduction of additional dance classes and increasing the amount of physical activity contributes to the formation of better adaptation of pupils to the study, although at the same time the developing fatigue during the school week is not completely mitigated, but it becomes less to a certain extent.

KEY WORDS: task performance, advanced motor mode, levels of performance, children of primary school age, ecology.

INTRODUCTION.

The problem of finding the optimal ratio of academic loading and physical activity in the conditions of modern school is an essential step towards the creation of an adequate training system (Tkhagova, 2006).

The increase in the extent of the static component during training should be compensated by the motor activity, which is not easy to implement in modern school, as the question of revising day regimen arises. The search for the ways to improve the level of health, task performance and the pupils' success in studying has led to the emergence of new physical culture and health models aimed at reducing the neuro-emotional stress, relieving hypodynamia syndrome. Integration of

alternative forms of motor activity (choreography, aerobics, musical eurhythmics, etc.) in the educational space meets the modern requirements of health-saving pedagogy (Antropova, 1977).

The constant decrease in the level of schoolchildren's health indicates the need for dosing the training load in accordance with the age and individual abilities of the organism. Any increase in load, both mental work and physical activity, can be considered as a stressful effect that is long-lasting and sustainable.

While the activity of the sympathetic part of autonomic division of nervous system is maintained at a sufficiently high level, the learning process is carried out in a stable functional state of a pupil. As soon as the adaptation reserves of the body decrease, a mismatch of the mechanisms of regulation of vegetative functions occurs, vital activity is realized in the mode of unstable adaptation, which manifests itself in children in the form of a decrease in efficiency, increased fatigue and reduced resistance to adverse effects (Gorbunov, 2003).

Within the context of traditional and new technologies of motor activity, the problem of pupils' adaptation to academic loading remains relevant. The main objective of these studies is to analyze the physiological mechanisms of adaptation and to get an opportunity to influence it via pedagogy and hygiene (Velichko & Smorodin, 2017).

Health and fitness activities for promotion of health should be based on human capabilities; the system of physical education should contain the means of influence on the physical, psychological and social components of health, where somatic and physical health is determined by the level of development and functioning of organs (brain, locomotor apparatus, analyzers), psychological health – by the state of mental comfort, and the social component of health is determined by the relationship between the members of the society and the compliance with the codes of behavior (Reshetnikov, 2000).

Currently, there has been the search for new physical culture and health models aimed at improving the health, task performance and success of pupils' learning. After all, motor activity develops motor skills, increases the functional and adaptive abilities of children, but the extent and content of physical activity matches the age and physical abilities of the schoolers (Kurmanali et al, 2018; Bakhshandeh et al, 2015).

It is essential to integrate into the educational space of alternative forms of motor activity (choreography, aerobics, musical eurhythmics, various sports) that meet modern fundamentals of health saving pedagogy. Any sport should be used, first of all, for full general physical development, general physical training and improving the health of schoolchildren and schoolgirls (Levchenko, 2002). A special place in this connection belongs to choreographic art as a kinesthetic form that uses a variety of different movements. The movements, organized by the musical rhythms into a dance, enriched with aesthetic content, double their healing powers (Reshetnikov, 2000).

Properly organized dance classes improve plasticity, develop an ear for music and a sense of rhythm, train the body functional systems. Regular physical activity during classes in choreography contribute to the improvement of the nervous system, positive shifts in its condition. This is connected with a powerful stream of afferent impulses, changes in the internal environment of the body. Sound rhythm, musical synchronization have a beneficial effect on rhythm of heart contractions, depth and rate of breathing, coordination of motor reflexes (Zaytseva, 2006).

Dancing is the primary means of preventing and treating easily developing defects in posture, scoliosis and flatfoot in primary school years. After a year of using special exercises that form the posture there are only barely noticeable deviations in most children who have the developed defects in their posture (Zare, 2015).

It is known that motor activity contributes not only to the development of basic motor qualities, but also improves the functional state of body systems, creating the prerequisites for harmonious physical development, intensive maturation, formation of psycho-physiological functions and increasing of functional reserves of the body (Gorokhova, 2018). It is the sufficient motor activity that significantly contributes to the expansion of adaptive capacities and general nonspecific resistance of the organism to unfavorable environmental conditions and can be considered as a factor that levels to a certain extent the effects of aggressive ecology.

All this indicates a need for a serious study of the processes of adaptation of children to training loads in the presence of the advanced motor mode.

DEVELOPMENT.

Objective of research.

It is to study the peculiarities of the physiological adaptation of 4th grade pupils to academic loads, in the context of the traditional form of education with increased motor activity (choreography) in the extended day regimen.

Materials and methods of research.

The studies were conducted on the basis of educational institutions – secondary school №7, Maykop, Municipal Educational Establishment “Progymnasium № 52”, Nalchik, Municipal Educational Establishment “Gymnasium № 13”, Nalchik, Municipal Educational Establishment “Secondary School №3”, Sarmakovo, the district of Zolsky.

The experiment was conducted in 2 stages: ascertaining and forming. Pilot testing covered 467 children, which were divided into 2 groups: control (172 people) and experimental (295 people).

In the experimental class, children got training according to the traditional educational system with an advanced motor mode – in addition to two lessons of physical culture and one lesson in eurhythmics per week, all the children practiced dancing 2 times a week after classes.

The aim of the ascertaining experiment was to identify the indicators of mental performance in children before the experimental lessons.

The methods of conducting dance classes in the 4th grade is based on various dance elements:

I. Allineation, greeting – 2 minutes.

II. Warm up activities round in a circle – 5 minutes.

III. Elements of dancing – 15 minutes: skip jumping, square running, hopak, touching the toes, lining, high skip step.

IV. Performing elements of modern dance – 15 minutes.

V. Back limber and suppling exercises – 8 minutes.

Thus, the pupils master the perfect form of movement, i.e. train to do exercises in the right directions, rhythm and pace, with appropriate muscle tension. Children of primary school age already master the combinations of various dance elements, which subsequently form a whole dance.

The aim of the forming experiment is to study the dynamics of mental performance of students, which was conducted during the school week (Monday-Saturday), at the beginning of the school year (October) and at the end of the school year (April). Task performance as a criterion for adapting to the training load and the child's body resistance to fatigue was assessed by the method of dosing work in time using the letter tables by V. Ya. Anfimov in the modification of the Research Institute of Physiology of Children and Adolescents of the Russian Academy of Education. This method enables to get performance indicators that most adequately reflect the functional state of the central nervous system of the body of schoolers in each time interval (school week, year) (Antropova, 1977).

The task was simultaneously given to the whole class and was completed within two minutes.

When processing the obtained results, the amount of work (intensity), i.e. the number of errors, was calculated. Then, in order to be able to compare the obtained data, the errors were standardized, that is, recalculated for 200 traced characters.

Then, statistical data processing was carried out. The arithmetic (M) and standard deviation ($\pm\delta$) were calculated for all the work performed before the first lessons and taken as the initial data. The value $M \pm \delta$ for each indicator was conventionally taken as the “norm” for each period of the experiment. Based on these data, one made an integrated assessment of the corrective tests performed where the speed and accuracy of the test were evaluated using a three-point system: I - high, II - average, III - low, and individual task assignments were distributed (1, 2, 4 - excellent and good work; 3, 5, 7 - satisfactory; 6, 8, 9 - unsatisfactory and poor). Excellent and well-executed correction tasks (1, 2, 4) indicate a high productivity of work, that is, indicate a high level of performance (II), work with an unsatisfactory grade (6, 8,9) – a low level (III).

For the complex performance of the group, we determined the number of work done excellently, unsatisfactorily and poorly, and we calculated the coefficient of preponderance of good work over poor work (“P”), which is the ratio:

$$“P” = \frac{\text{the number of excellent and good works (1,2,4)}}{\text{the number of unsatisfactory and poor works (6,8,9)}}$$

The percentage of perfectly correct works was used as one of the performance criteria. This is the ratio of the number of perfectly correct works to the total number of students multiplied by 100%:

$$\% \text{ perfectly correct} = \frac{\text{the number of perfectly correct works}}{\text{works}} \times 100 \%$$

The results obtained were processed by the method of mathematical statistics using Student’s t-test.

Research results.

The study of weekly dynamics of TP in the schoolers of primary school age according to the traditional curriculum in the advanced motor mode showed that during the school week (average annual data) in general, fourth-graders who had been trained according to the traditional curriculum in the advanced motor mode showed the following changes in task performance.

As Table 2 shows, the intensity of work increases from Monday to Tuesday, it insignificantly decreases on Wednesday and further to Friday, it increases again on Thursday and Friday and reaches its initial level by Saturday (Monday).

There were no significant changes in the number of errors during the school week, although there was a tendency to a slight decrease (1.2 ± 0.09), compared with the initial value on Monday (1.3 ± 0.07), and an increase by the end of the week. The accuracy of the work is an informative indicator of the state of cortical neurodynamics, as it reflects the ability to differentiate inhibition. The integrative coefficient indicator “P”, which reflects the prevalence of good works on the bad ones, increases significantly (2.5 ± 0.09) compared to the initial level (1.3 ± 0.07), then this indicator decreases by the end of the week from Thursday minimum to 1.6 ± 0.07 . The percentage of perfectly correct work during the school week decreases from Monday to Friday to $10.1 \pm 2.75\%$ ($24.2 \pm 2.63\%$), as evidenced by the significant stress on the functional systems of the body (Table 1).

Thus, students have a fairly good task performance at the beginning of the week, and then, it decreases during the school week, especially on Wednesday. The data obtained indicate the beginning of the development of fatigue on Wednesday, and then some relief by the end of the week. The preservation of the coefficient “P” in the dynamics of the school day above the unit indicates a moderate development of fatigue, since a decrease in the coefficient “P” below the unit would indicate an alarming situation – a significant development of fatigue among schoolchildren.

Table 1. Weekly Dynamics of Some Indicators of Task Performance of Pupils of Junior School in the Advanced Motor Mode (Annual Average Data) (M±m).

The period of observation	Gender	Measurements	A	B	Coefficient "P"	% Perfectly correct works
Monday	Total	264	270,2±2,67	1,3±0,07	1,3±0,07	24,2±2,63
	Girls	144	271,5±3,58	1,3±0,09	1,1±0,08	23,2±3,51
	Boys	120	269,0±3,96	1,4±0,10	1,4±0,10	24,4±3,92
Tuesday	Total	264	283,2±2,58**	1,7±0,08***	2,5±0,09***	18,4±2,38
	Girls	144	282,5±2,38*	1,5±0,10	2,3±0,12***	19,2±3,28
	Boys	120	283,8±2,63*	1,9±0,12**	2,7±0,15***	17,6±3,47
Wednesday	Total	264	277,5±2,33*	1,3±0,07	1,8±0,08***	19,2±2,42
	Girls	144	277,5±2,78	1,2±0,09	2,1±0,12***	21,5±3,42
	Boys	120	277,5±2,97	1,4±0,10	1,6±0,11	16,1±3,35
Thursday	Total	264	289,8±2,22***	2,0±0,08***	1,6±0,07***	18,2±2,37
	Girls	144	279,9±2,98**	1,9±0,11***	1,7±0,10***	21,2±3,40
	Boys	120	299,7±3,29***	2,1±0,13***	1,5±0,11	15,5±3,30
Friday	Total	264	293,5±2,44***	2,3±0,09***	3,2±0,11***	10,1±2,75***
	Girls	144	279,8±3,28	2,4±0,12***	2,6±0,13***	10,5±1,88***
	Boys	120	305,5±3,62***	2,2±0,13***	3,7±0,17***	9,7±2,70***
Saturday	Total	264	278,7±2,78**	2,0±0,08*	3,2±0,09***	12,1±2,01***
	Girls	144	268,8±2,38*	2,0±0,11**	1,6±0,10***	12,3±2,73**
	Boys	120	290,8±2,63*	2,1±0,13***	2,7±0,15***	11,9±2,95**

Note: A intensity of work – the number of processed characters within 2 minutes; B – the number of common errors (per 200 characters); "P" – the coefficient of preponderance of good works over poor ones; %CW – the percentage of perfectly correct works. Reliably P<0.05; P<0.01; P< 0.001***

This is confirmed by the analysis of the number of children with different levels of task performance.

Figure 1 illustrates that during the school week, starting from Tuesday, there is an increase in the

group of students with a high level of performance, especially on Friday (from $30.9 \pm 2.84\%$ to $40.9 \pm 3.02\%$), and from average and low decrease (from $44.9 \pm 3.06\%$ to 43.7 ± 3.05 ; from $24.2 \pm 2.63\%$ to $15.4 \pm 2.22\%$), that is, there is a redistribution in groups by levels of performance.

The decrease in task performance at the end of the school week is caused by the development of natural fatigue under the influence of academic loading. Some reduction in task performance after a physical education class on Saturday is probably the result of increased arousal in the motor centers of the cortex under the influence of physical exercises and the creation of a motor dominant, which through induction causes inhibition in other nerve centers of the cortex and negatively affects the quality parameters of task performance. But this does not have a negative influence on further task performance, since the lesson in physical culture is the final.

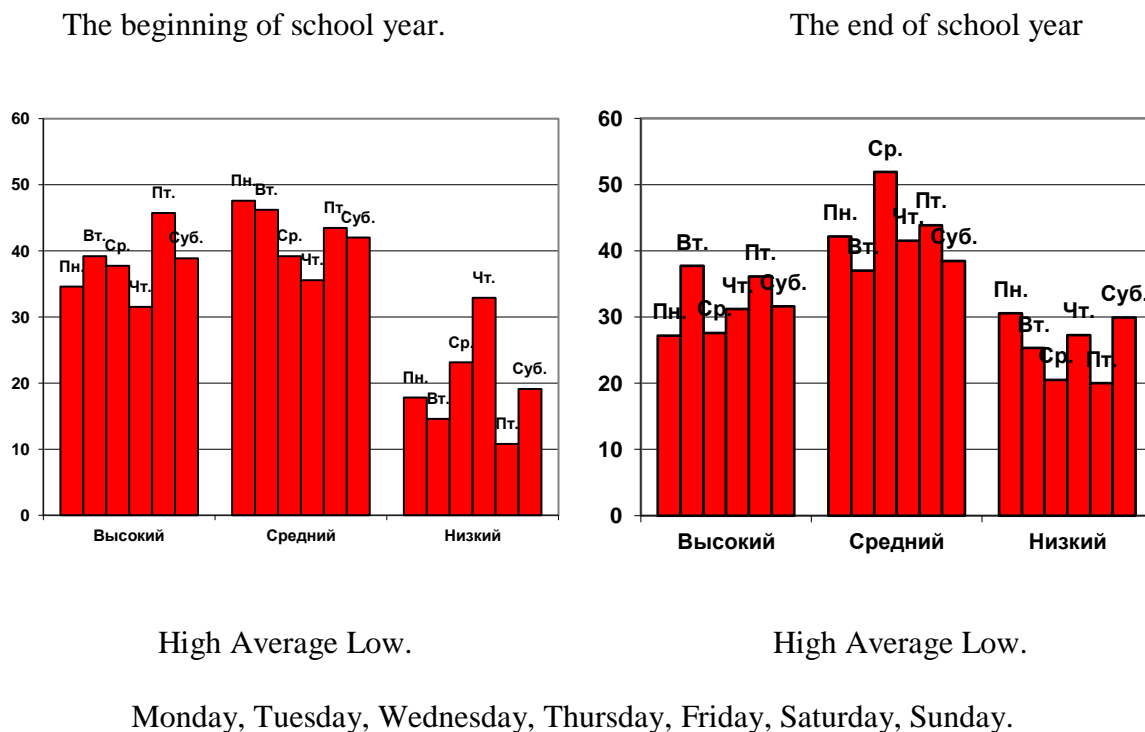


Fig. 1. Weekly Dynamics of Task Performance Levels of 4th Grade Schoolers in the Conditions of the Advanced Motor Mode (Annual Average Data) ($M \pm m$).

It should be noted that in the 4th grade, the initial level of intensity of work for girls and boys was about the same, although for girls the efficiency from Thursday to the end of the school week was greater than that of boys (Table 1). Obviously, during the period of training, an advanced motor mode contributes to a higher level of morphological maturity of the central structures and regulatory mechanisms, which increases the functional state of the neuromotor apparatus of the right hand, most pronounced in girls.

At the beginning of the school year, the nature of the daily dynamics of task performance in girls and boys was about the same, but by Friday and Saturday the girls' task performance worsened to a greater extent than the boys'. This was manifested in the lower intensity of work (268.8 ± 2.38 against 290.8 ± 2.63 characters) and the coefficient "P" on Saturday (1.6 ± 0.10 against 2.7 ± 0.15) (Table 1). At the end of the school year, the changes in TP in the dynamics of the school day were similar to the beginning – by the end of the school week there was a decrease in working capacity, both among girls and boys, but it was more pronounced among girls. Typically, girls tend to be more active, more diligent, to have conscientious attitude to lessons, especially in the final year of primary education, in order to successfully complete it. This probably led to more fatigue among them than among boys.

Despite some differences in the initial indicators of task performance, in general, the nature of changes in the weekly dynamics of task performance, both among girls and boys were about the same, that is, there was a deterioration in task performance by the end of the week, but the "P" coefficient was lower among boys than that among girls on Wednesday and Thursday, indicating a greater tension in the boys' nervous system.

The results of the study of weekly dynamics of task performance of the 4th grade pupils indicate that the introduction of additional dance classes, increasing the amount of physical activity, contributes to the formation of better adaptation of schoolers to academic loading, although at the same time,

the developing fatigue during the school week is still not completely removed but becomes less to a certain extent.

Thus, when developing effective ways to prevent the negative effects of increased training loads, it is necessary to use a positive effect on the growing body of motor activity, given that the uncontrolled expansion of the volume and intensity of motor activity in the day regimen can lead to an overload of pupils, and, as a result, decrease in the level of task performance and health.

CONCLUSIONS.

As conclusions of the research:

1. In the weekly dynamics of TP of the 4th grade schoolers, in conditions of integration of the traditional form of education and increased physical activity a rather good TP is observed, the intensity of work and the “P” coefficient both among boys and girls increase from Monday to Tuesday, slightly decreases on Wednesday, remaining higher than on Monday, it is growing again by Friday and it becomes as in its original level by Saturday. The number of errors in the first half of the week remains almost unchanged, and then increases by the end of the week.
2. The increase in fatigue by the end of the week, that is observed in the 4th grade pupils, corresponds to the classical biorhythm curve of the schoolchildren’s capacity for work and is a natural reaction of the body to the academic loading. Educational work in the 4th grade is carried out at the expense of some tension in the central nervous system of pupils, as evidenced by a slight decrease in the level of children’s working capacity in the middle of the week (on Wednesday), compared to Tuesday. Obviously, a higher academic loading at the final stage of primary education requires a more significant tension of the functional systems of the body. The annual dynamics of TP has a favorable change, especially at the end of the school year, which indicates a good adaptation of pupils to academic loading.

3. It has been established that the direction and intensity of changes in the TP parameters in the dynamics of the school week and year are approximately the same among girls and boys the deterioration of TP by the end of the school week, i.e. on Saturday, but it is more pronounced in girls than in boys, especially at the end of the school year. Obviously, girls studied more intensively than boys to successfully graduate from primary school. Thus, the adaptation of girls to increased mental and physical activities is better than that of boys.

4. In order to maintain high performance and health of schoolchildren, the success of their training in terms of classes in a traditional program with an advanced motor mode, it is essential to:

- Continue the search for more effective patterns of motor activity of pupils, that would most fully help to solve correctional and health problems and relieve fatigue in the mode of training sessions. At the same time, to satisfy the “motor hunger” of a child and not to hyperactivate a negative impact on the educational process.
- Take into account the physical and age possibilities of schoolchildren in order when organizing the educational process with the use of alternative forms of motor activity to avoid fatigue and deterioration in the health of children.
- Increase motor activity not linearly, but gradually to some individual optimum, not excessively.
- The duration of exercise should not last more than 60 minutes due to the imperfection of the mechanisms of thermoregulation in children of primary school age.
- It is necessary to use the principle of gradualness in increasing physical loads in daily mode.
- It is necessary to use alternative forms of motor activity more intensively (choreography, aerobics, musical eurhythmics, various kinds of sports).
- When carrying out various forms of motor activity, it is necessary to take into account the need-motivational sphere of pupils and, in accordance with this, apply various means of physical education.

- It is necessary to correct the schedule taking the difficulty of individual lessons into account.
- Actively use a variety of preventive and recreational activities aimed at relieving fatigue, enhancing the adaptive capabilities of the child's body, to form pupils' sustainable skills for a healthy lifestyle.
- Create a favorable psychological environment for pupils at school and at home, to engage a school psychologist to conduct psychological trainings with children.
- Work with parents on the organization of the pupils' day regimen, food and rest.
- Continue the monitoring studies of various physical culture and health models on the adaptation of children to training loading, in order to identify the formation of short-term and long-term adaptation processes at different stages of ontogenesis.

It can also be concluded that in conditions of environmental distress, only sufficient physical activity contributes to the expansion of adaptive capabilities and increases the nonspecific resistance of the body of children, which allows to a certain extent to resist the harmful effects of the environment and maintain human health at an optimal level.

The conflict of interests.

The authors confirm that there are no conflicts of interest.

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