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THE INFLUENCE OF STRETCHING ON GENERAL PHYSICAL PREPAREDNESS

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Improving physical activity, physical preparedness and health of student youth is an urgent issue for both physicians and teachers in Ukraine. The reduced interest of school children in traditional physical education encourages to search for new forms and methods of increasing physical activity.

In addition, there is a tendency of health and physical preparedness decrease among adolescents, the disappointing prevalence of hypodynamics of the younger generation.

One of the ways to involve the younger generation in specially organized physical activity is extracurricular stretching classes. Such classes, in addition to a specific focus on the development of flexibility, make their adjustments to the indicators of general physical preparedness.

The study involved 35 high-school-age girls who regularly attended extracurricular stretching classes during the school year. In order to analyze the impact of the annual cycle of classes on endurance, speed and coordination, we conducted appropriate motor tests (the Cooper 12-minute run test; *100-metre dash*; *shuttle running 4x9 m*).

As a result of the study we obtained the following totals among students before attendance of stretching classes: endurance X=2388 m, δ=138.2, m=23.35; speed – X=17.71 s, δ=0.4, m=0.068; coordination – X=12.33 s, δ=2.5, m=0.42. The obtained data correspond to the average level of physical preparedness.

After the annual cycle of classes, there was an improvement in individual indicators of endurance, speed and coordination in all tests, but the average group statistically significant changes (p<0.01) were observed in terms of speed (X=17.34 s., δ=0.3, m=0.052) and coordination (X=11.24 s., δ=2.05, m=0.34). At the same time, endurance indicators (2434 m, δ=130.1, m=22.0) did not change statistically significantly (p≥0.1). The data obtained are evidence that the annual cycle of stretching has a positive effect on the general physical preparedness of girls aged 15-16.

Key words: *stretching, high-school-age girls, general physical preparedness, endurance, motor tests, speed, coordination, the Cooper 12-minute run test; 100-meter dash; shuttle running 4x9m*

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ВПЛИВ СТРЕТЧИНГУ НА ЗАГАЛЬНУ ФІЗИЧНУ ПІДГОТОВЛЕНІСТЬ

Б. Р. Задворний

Підвищення рухової активності, фізичної підготовленості та стану здоров'я учнівської молоді є нагальним питанням як українських медиків так і для педагогів. Знижена зацікавленість учнів до традиційних занять фізичною культурою, спонукає до пошуку нових форм і методів підвищення рухової активності. Окрім того, прослідковується тенденція до зниження здоров'я та фізичної підготовленості підлітків, невтішна динаміка гіподинамії і підростаючого покоління.

Одним з способів залучення учнів старшої школи до спеціально організованої рухової активності є позаурочні заняття стретчингом. Стретчинг – один з видів освітньо-розвиваючого оздоровчого напрямку занять, що передбачає виконання комплексу індивідуально-підібраних фізичних вправ у вигляді повільних і плавних рухів. Такі заняття, окрім специфічної направленості на розвиток гнучкості, вносять свої корективи на показники загальної фізичної підготовленості.

У дослідження були залучені 35 дівчат старшого шкільного віку (15-16 років), які протягом навчального року систематично відвідували позаурочні заняття стретчингом. З метою аналізу впливу річного циклу занять на показники витривалості, швидкості та координації, ми проводили відповідні рухові тести та аналізували динаміку показників (12-хвилинний біговий тест К. Купера; біг на 100 м; човниковий біг 4х9 м).

В результаті дослідження, ми отримали такі дані: до занять стретчингом показники витривалості X=2388 м., δ=138,2, m=23,35; швидкості – X=17,71 с, δ=0,4, m=0,068; координації – X=12,33 с, δ=2,5, m=0,42. Отримані дані відповідають середньому рівню підготовки.

Після річного циклу занять, відмічено покращення індивідуальних показників витривалості, швидкості та координації за всіма проведеними тестуваннями, проте середньогрупові статистично значимі зрушення ($p<0,01$) відмічені за показниками швидкості (X=17,34 с., δ=0,3, m=0,052) та координації (X=11,24 с., δ=2,05, m=0,34). В той же час, показники витривалості (2434 м., δ=130,1, m=22,0) статистично значимо не змінились ($p\geq0,1$). Отримані дані є свідченням того, що річний цикл занять стретчингом позитивно впливає на фізичну підготовленість дівчат 15-16 років.

Ключові слова: *стретчинг, старшокласниці, фізична підготовленість, рухові тести, витривалість, швидкість, координація, 12-хвилинний біговий тест К. Купера, біг на 100 м, човниковий біг 4х9 м.*

Introduction of the issue. Starting from 2017, the main control indicator of the state of physical development and health of Ukrainian population is the annual assessment of physical preparedness (the Draft Strategy for the Development of Physical Education and Sports among the Student Youth until 2025).

Physical preparedness is the level of a person's ability to perform various tasks according to age, which is characterized by a set of physical qualities that they possess at the time of the examination. Physical preparedness is achieved during the process of regular specially organized motor activity. In this case, the general physical preparedness is the result of physical activity and characterizes the level of development of basic physical qualities and skills. General physical preparedness is considered [3] as an integral indicator, because in the process of performing physical exercises almost all organs and systems interact with each other. According to (V. Zakhozhiy, O. Dykiy), the level of physical preparedness of modern high school students is mostly low or medium, which necessitates additional physical exercises.

Taking into consideration a WHO study, there is a tendency to reduce the physical preparedness and activity of young people around the world, and it

is noted that girls have much lower physical activity than boys. Current global guidelines state that young people under the age of 17 should be physically active for at least 60 minutes a day (moderate intensity) and engage in high-intensity exercise at least three times a week [8].

To determine the effectiveness of physical education, a necessary element that should be taken into account is a comprehensive assessment of physical preparedness of students according to the data of the psycho-physiological and functional capabilities. As stated by scientists (V. Lyzogub, V. Pustovalov, G. Zganyayko), this approach will provide a personality-oriented strategy to the organization of students` own motor activity and evaluation of their achievements.

Confirmation of the need to improve the system of physical education among students is the results of a study of physical development level of schoolgirls of different years (O. Diagovets). The data prove that the physical development of the younger generation, especially girls, requires immediate intervention due to the fact that every year children become weaker. For instance, the body's adaptation to the environment and exercise on a regular basis is very slow and requires a lot of energy.

We support the opinion of V. Leleka [5] that one of the ways to solve the problem of motor activity deficit is to increase attention to physical education, search for new forms and methods of teaching, and introduce innovative pedagogical technologies into the educational process, so that latter will improve in accordance with modern requirements.

The National Doctrine on the Development of Education clearly explains that the use of various forms of physical activity and other means of physical improvement will significantly reduce the morbidity of adolescents, lay the foundations for the development of physical, mental, social and spiritual health.

Current state of the issue. Thus, much attention is paid to the readiness of physical education teachers to form a healthy educational environment (N. Belikova, O. Dubogai, N. Zavidovskaya, N. Pangelova); features of teaching students physical exercises (T. Kropyva, N. Seleznyova, O. Artyushenko, O. Andriychuk); study of physical preparedness, physical development and physical abilities of children and adolescents (V. Lyzogub, V. Pustovalov, I. Vaskan).

Recent studies reveal that the figures of physical preparedness among adolescents have a tendency to decrease. As for analysis of the development of students' physical qualities, the totals of flexibility development in high school students remains unrealized in comparison with stabilization of endurance, speed and strength. This trend occurs due to the fact that at school, in the process of physical education more attention is paid to the development of endurance, speed and strength. Analysis of age-related anatomical and physiological changes and dynamics of physical qualities among girls aged 15-16 years showed that the rate of weight gain and growth experienced a decline, while the indicators of speed, endurance, agility, strength remained constant (I. Mudrik).

In the multifactor analysis of the academic success of high school students (N. Seleznyov), such a factor as "sex" has a significant impact on success, focus, responsibility. At the same time, older girls do not receive enough information about the impact of exercise on the formation of reproductive health (J. Sotnik). Such data indicate the presence of age-related psychological and physiological prerequisites for systematic training in specially organized motor activity. Moreover, it confirms the relevance of our study and the need for greater

involvement of high school students in extracurricular forms of physical education, which will allow a wider application of an individual approach in accordance with the specific features of the female body.

Thus, we invited high school students to attend extracurricular stretching classes. This form of classes corresponds to the Law of Ukraine "About Extracurricular Education", which emphasizes the importance of forming in students a conscious and responsible attitude to their own health and the health of others, skills of safe behavior; the need to create conditions for meaningful recreation and enhance students' knowledge of a healthy lifestyle, the organization of their recovery, acquisition and consolidation of skills, strengthening personal health and the formation of a individual hygienic culture.

Outline of unresolved issues brought up in the article. Analysis of the work of scientists on the peculiarities of the application of stretching classes mainly aimed at considering the classification of stretching exercises (M. Putkisto, T. Loza, A. Khotymchenko); characteristics of stretching types (V. Petrovich, A. Alyoshin); study the facilities of the classes organization and the dynamics of the flexibility development (V. Favorit, V. Petrovich, L. Karpenko).

However, in our opinion, it is necessary to analyze in detail the impact of regular stretching classes on the indicators of general physical preparedness.

Aim of research is to study the dynamics of indicators of general physical preparedness during the annual cycle of stretching.

Research methods. The study involved 35 high school girls (15-16 years old). All participants and their parents were informed about the purpose and objectives of the study, a written informed consent was received. The subjects involved were normotensive, had no cardiovascular disease, metabolism, neurological disorders, no injuries or musculoskeletal disorders.

The students involved in the study attended classes three times a week. Duration of one lesson – 90 minutes. The structure of the lesson is traditional, it consists of preparatory, main and final parts.

The set of exercises, during classes, included two groups of special physical exercises depending on the involvement of the musculoskeletal system [4]: local physical exercises – exercises for developing mobility in individual joints; integral physical exercises – exercises aimed at developing mobility in several joints, which allows a person to change the position of the body depending on the motor situation.

The amount of physical activity depends on the regime. The annual cycle of classes consists of two modes: developmental and supportive. In the developmental mode (in the first semester of the school year), the proportion of physical exercises was used: 40 % – active, 40 % – passive, 20 % – static. During the first classes, the number of repetitions of each exercise was 8-10 times with a gradual increase to 30-50 times. The density of classes reached 75 % or more [2]. In the maintenance mode (second semester of the school year), in contrast to the developmental mode, the physical activity was much lower, the number of repetitions of exercises decreased. The rules remained unchanged: the movements are performed with a gradual increase in amplitude; movements during exercise should not cause pain.

To solve the problem of studying the impact of the annual cycle of stretching classes on the general physical preparedness of high-school-age girls, we analyzed endurance, speed and coordination according to motor tests (the Cooper 12-minute run test; 100-

meter dash; shuttle running 4x9m). Indicators of strength and flexibility in this paper were not examined.

To process the obtained data, we used the MedStat software. We calculated arithmetic means (X), standard deviations (δ) and error (m) for the variation series of which the distribution does not differ from the normal one at the significance level p ≥0.1. According to the principle of marginal sigma deviations, the levels of physical preparedness were determined.

Results and discussion. Stretching is a specially designed system of exercises aimed at improving flexibility and mobility in the joints, and at the same time to strengthen these joints, training of the musculoskeletal system to improve elastic properties, create strong muscles and ligaments. The essence of this system is that a certain posture (body position) is accepted and held for some time with the help of very slow and smooth movements (flexion and extension) aimed at stretching a particular muscle group,

According to research (V. Lenishin), stretching involves the use of the following methods:

- active stretching of the muscles, followed by their isometric tension - first there is an active stretching of the muscles, after which the position of maximum stretching is maintained for a few seconds, by reducing the antagonist muscles without changing their length. This allows a person to strengthen antagonistic muscles, develop active flexibility, helps to eliminate imbalances in the development of strength and flexibility;

- passive stretching of muscles with active maintenance of the limit position - stretching occurs first with the help of external influence (partner, trainer, weight, rubber band, grip, etc.), followed by maintaining the position with maximum amplitude through active muscle contraction;

- active stretching of muscles with passive stretching – is realized by actively reducing the group of antagonistic muscles, and after reaching the maximum amplitude (before the pain), the partner slowly performs a passive forced increase in amplitude.

The content of stretching exercises, as a kind of physical exercise (B. Shiyan), is formed on the one hand by biomechanical processes (actually physical movements and operations), which make the basis of stretching exercises, and, on the other hand, the processes occurring in the body during the performance of exercises. The course of these processes is characterized by physiological, biochemical changes in the body, which are depended on psychological and pedagogical activation. Physiological changes under the influence of stretching exercises are manifested by an increased level of metabolic processes, functional activity of organs and systems of the body.

During the stretching exercises in the body such processes occur (T. Loza): increase in the tone of subcortical formations of the brain due to intense proprioceptor impulses; activation of metabolism in the musculoskeletal system due to local irritation of nerve endings; mobilization of fat depot because of a combination of stretching and strength exercises; Improving coordination, training of arbitrary tension and muscle relaxation while performing stretching exercises for muscle tension and relaxation.

Taking into account the peculiarities of the stretching program, we can identify certain advantages: the transformation of natural movements into physical exercises; the possibility of local impact on individual muscle groups and joints; capability to regulate physical activity individually; possibility of combination with other types of physical education and sports; possibility of musical accompaniment of

classes to increase the positive mood of students; social accessibility of classes.

Conducting motor tests at the beginning of the study and after the annual cycle of stretching classes, we determined the results of endurance, speed and coordination as indicators of general physical preparedness.

On a five-level scale, the following ranges were identified: low level of physical preparedness – from X-1.5 δ and less; lower than the average level of physical preparedness from X-0.5 δ to X-1.5 δ; average level of physical preparedness from X-0.5 δ to X+0.5 δ; higher than the average level of physical preparedness – from X+0.5 δ to X+1.5 δ; high level of physical preparedness from X+1.5 δ and more.

According to the data obtained, a specific limit range of indicators was formed on a five-level scale of endurance, speed and coordination as manifestations of physical preparedness of high school girls participated in the study.

Table 1

Indicators of limit five-level scales according to general physical preparedness tests results

Indicator	Assessment method	Physical preparedness				
		High	**Above average**	**Average**	**Below average**	**Low**
Endurance	Cooper 12-minute run test, m.	2597 and more	2596-2458	2457-2320	2319-2182	2181 and less
Speed	100-meter dash, sec.	17,06 and less	17,07-17,5	17,51-17,9	17,91-18,3	18,31 and more
Coordination	Shuttle running *4x9m*	8,58 and less	8,59-11,08	11,09-13,58	13,59-16,08	16,09 and more

Overall endurance, as a person's ability to overcome fatigue in the process of motor activity, was assessed by the results of the Cooper 12-minute run test. Testing method: a research participant had to overcome (run or alternate running with walking) as much distance as possible in 12 minutes. The passed distance was measured by recording its length with an accuracy of 10 m. According to the test results, the level of physical preparedness was established. Thus, at the beginning of the study (before regular stretching) we obtained the following data: X=2388 m, δ=138.2, m=23.35.

At the end of the study (after an annual cycle of stretching), we conducted a similar test. Endurance indicators were: X=2434 m, δ=130.1, m=22.0. According to the level of training, the results of the girls improved (Table 2). However, when comparing the data obtained at the beginning of the study and at the end of

the study, according to Student's criterion, the difference between the average values is not statistically significant (T=1.41, the number of degrees of freedom k=68, p=0.163).

Table 2

Endurance test results (the Cooper 12-minute run test), m

Level of physical preparedness, % (n =35)										
At the beginning of the experiment						**At the end of the experiment**				
	High	**Above average**	**Average**	**Below average**	**Low**	**High**	**Above average**	**Average**	**Below average**	**Low**
n	-	13	12	6	4	4	14	9	8	-
%	-	37,1	34,3	17,1	11,5	11,4	40,0	25,8	22,8	-
X	2388					2434				
δ	138,2					130,1				
p	0,163									

Speed, as an indicator of general physical preparedness, we determined by running time per 100 m (running in a straight line) using a hand-held stopwatch. At the beginning of the study, the following data were obtained: X=17.71 sec., Δ=0.4, m=0.068. According to the individual test results, the level of physical preparedness was found. Analyzing the effect of stretching on the speed of girls, at the end of the study, we conducted a similar test which showed that X=17.34 sec., Δ=0.3, m=0.052. According to the level of training, the results of the girls improved (Table 3).

When comparing the data obtained at the beginning and end of the study, according to Student's criterion, we found the difference between the averages is statistically significant (T=4.31, the number of degrees of freedom k=68, p<0.001).

Table 3

Speed test results (100-meter run), sec

Level of physical preparedness, % (n =35)										
At the beginning of the experiment						**At the end of the experiment**				
	High	**Above average**	**Average**	**Below average**	**Low**	**High**	**Above average**	**Average**	**Below average**	**Low**
n	1	14	12	5	3	7	20	5	3	-
%	2,8	40,0	34,3	14,3	8,6	20,0	57,1	14,3	8,6	-
X	17,71					17,34				
δ	0,4					0,3				
p	<0,001									

The indicator of coordination abilities, as a manifestation of physical preparedness of high school female students, we determined by the results of the test "Shuttle running 4x9m" using a hand-held stopwatch. According to the individual test results, the level of physical preparedness was found. Summarizing the results, we obtained that X=12.33 sec., Δ=2.5, m=0.42. Repeated testing after the annual cycle of stretching, showed the

following generalized results: X=11.24 sec., Δ=2.05, m=0.34 (Table 4).

When comparing the data obtained at the beginning of the study and at the end of the study, according to Student's criterion, the difference between the averages is statistically significant (T=2.0, the number of degrees of freedom k=68, p=0.049).

Table 4

Coordination test results ("Shuttle running 4x9m"), sec

Level of physical preparedness, % (n =35)										
At the beginning of the experiment						At the end of the experiment				
	High	Above average	Average	Below average	Low	High	Above average	Average	Below average	Low
n	2	10	13	8	2	3	15	12	5	-
%	5,7	22,9	37,1	28,6	5,7	8,6	42,8	34,3	14,3	-
X	12,33					11,24				
δ	2,5					2,05				
p	0,049									

Conclusions and research perspectives. Analyzing the results, we can suggest that regular stretching classes during the school year have a positive effect on such indicators of physical preparedness as endurance, speed and coordination.

However, it should be noted that, with the improvement of individual endurance indicators in girls, there is no statistically significant increase in the group average indicator. At the same time, there was an improvement in both individual and group indicators of speed and coordination within statistically significant limits.

The obtained data reveal that the annual cycle of extracurricular stretching classes has a positive effect on the general physical preparedness of girls aged 15-16. For the widespread introduction of stretching that is found to be socially accessible (stretching does not require expensive special inventory or equipment, only the presence of comfortable sportswear), it is necessary to implement the following components:

- educational work with students – purposeful explanation of the need for systematic classes with specially organized motor activity;
- support at the state level – introducetion of stretching as an element of a variable module to physical education curricula for senior classes of general educational institutions;
- professional training of stretching coaches (teachers, lecturers) to work with students;
- sanitary and hygienic requirements (for instance, a proper place for training (lighting, air temperature, ergonomic equipment, musical accompaniment).

Further long-term research plans include the study of the dynamics of strength and flexibility in the process of stretching.

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