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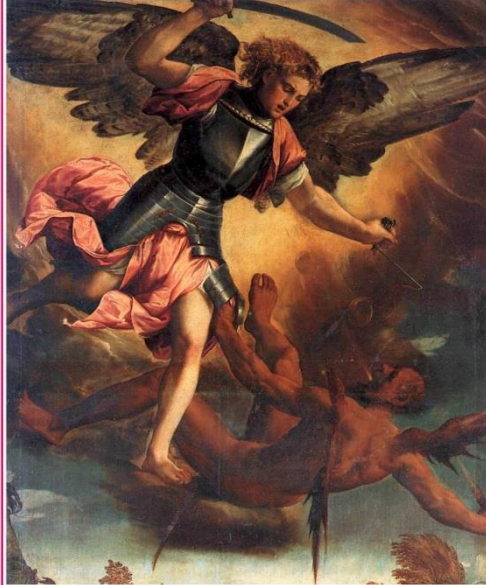
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# Exercise System for the Development of Student's Motor Capacity

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## Abstract

This article provides recommendations for the formation and development of students' coordination abilities in physical education classes via a special sociological questionnaire. As a result, coordination of movements with closed eyes after the standard load at t 4.43 (p <0.001); t 3.82 (p <0.001) and 3.27 (p <0.01) confirmed a high level of improvement in the development of sensory (sensitive). In conclusion, a functional model of development and assessment of the student's coordination abilities has been created, with the help of which the targeted formation of the students' motor and functional potential and physical activity is ensured.

**Keywords:** Coordination, abilities, students, sports, activity.

## *Sistema de ejercicio para el desarrollo de la capacidad motriz de los alumnos*

### **Resumen**

Este artículo proporciona recomendaciones para la formación y el desarrollo de las habilidades de coordinación de los estudiantes en las clases de educación física a través de un cuestionario sociológico especial. Como resultado, la coordinación de movimientos con los ojos cerrados después de la carga estándar en  $t$  4.43 ( $p < 0.001$ );  $t$  3.82 ( $p < 0.001$ ) y 3.27 ( $p < 0.01$ ) confirmaron un alto nivel de mejora en el desarrollo sensorial (sensible). En conclusión, se ha creado un modelo funcional de desarrollo y evaluación de las habilidades de coordinación del estudiante, con la ayuda de la cual se garantiza la formación específica del potencial motor y funcional y la actividad física del estudiante.

**Palabras clave:** Coordination, Abilities, Students, Sports, Activity.

### **1. INTRODUCTION**

At the present stage of development of civil society, the quality of education is a big problem caused by the acceleration of socio-economic progress, which has aggravated the problems of students' functional preparedness in relation to their own health. If you take the health status of students for 100% at the beginning of training, then before graduation, it worsens by 75%! In recent years, paradigmatic transitions have been observed from the multidisciplinary structure of

curricula to activity-oriented qualification characteristics (with a weakening of knowledge, fundamental and humanitarian components); to GEF 3 ++ with the strengthening of knowledge, fundamental and humanitarian components and the weakening of activity-oriented; for GEF 3 +++, combining positive in qualification characteristics and qualification requirements as grounds for a comprehensive assessment of activity-oriented (practical) training of graduates with positive competence in the GEF 3 +++ corresponding to Bologna processes (Iseman, 2014; ; Eilzaki & Jalalian, 2016).

The concept of the development of the Russian Federation until 2020 set the goal of physical development of the population, the achievement of which requires the solution of the problem of improving the quality of the process of physical education and the health of the population. Thus, the main methodological feature of the content of higher education is the underestimation of the role of the motor activity of graduates, which is especially significant in their professional activities. For this purpose, applied physical education has been introduced in modern curricula - modules for sports. Students have the right to choose for themselves sections according to sports or a system of physical exercises for the development of professional coordination abilities and competencies (Aleshina, 2014; Millanei & Khalili, 2016).

Now modern students have more time to improve the efficiency and quality of their independent study of science and sports, as there is no urgent need to take care of quality accommodation and nutrition. These problems are assumed by the university itself, student self-

government, as it should be in the leading universities of the world. After the end of the lecture and practical classes, seminars on a schedule, each student has free time, which must be effectively used to improve intellectual and physical abilities. This is indicated by modern scientists, in particular (Vilensky, 2014).

## **2. METHODS**

### **The study design**

The study design consisted of a clearly developed survey plan for 11 universities. For this purpose, a specialized questionnaire was developed and tested. During 2015-2018, students' attitudes toward a healthy lifestyle, physical education and sports were monitored using a special questionnaire.

### **Experiment Participants**

The questionnaire was designed for both students and university professors. Such a sociological study included two parts: an interview and respondents' answers to the questionnaire. 1860 students from 11 different universities and cadets of 2 military institutes were interviewed.

### **Structure and objectives of the developed program**

The sociological analysis showed that students mainly practice a healthy lifestyle, enjoy various sports, try to improve their health with

these classes, to live without drugs, to have enough time to relax and use their leisure time rationally (Bondin, 2014).

### **Limitations of research and ethical issues**

The survey involved only students of the main group for health reasons, the questionnaires themselves were nameless. In subsequent surveys, we attracted students with disabilities and took their wishes into account in organizing physical therapy classes. The departments of physical culture, sociology and political science of the university during 2015-2018 performed a comprehensive sociological study. Analysis of the results of this study shows that more than 60% of students of the Faculty of Humanities are engaged in the main group in physical culture. The rest of the students have limitations in their state of health and are engaged in a special medical group, where most economists, political scientists, financiers, and translators are employed.

According to a sociological study, students before entering the university were actively involved in various sports 85% and now would like to practice on a modern sports base: 35% - aerobics, tourism, sports games (Kazin & Kasatkin, 2014). The largest first block, the methodology of which consists of general preparatory and summing exercises performed on the floor and elevations in statics and in dynamics (Bezrykhih, 2014), belongs to the initial study stage. These physical exercises are represented by equilibrium components and two main types of equilibrium: static (isometric mode of muscle work, causing specific static manifestations to maintain balance) and

dynamic, in which equilibrium is kept in motion (Yang et al., 2019; Soo et al., 2019; Rasooli & Abedini, 2017):

- Maintaining balance for a long time in different initial positions (feet together, feet apart, separately on the left, then on the right legs, in a rack) when performing various physical exercises without objects;

- Long-term balance after rotational movements from 1 to 20 times around the vertical axis with a stop first in the pose of the leg together, then separately on the left, then on the right leg and, finally, in the rack;

- Long-term retention of balance after rotational movements in the horizontal plane (forward and backward from 1 to 20 times) first in the pose of the leg together, then separately on the left, then on the right leg and, finally, in the pose;

- Long-lasting balance on the left, then on the right foot, in posture after jumping over the line, triangle, square with turning to the right, then to the left;

- Maintaining balance in the rack when performing the technique of motor actions on the block simulator device;

- Maintaining balance in the rack when performing equipment with the simultaneous active formation of a small lateral equilibrium on the simplest simulator - a training device in the form of a  $\delta$  round log with small swings to the sides;

- Keeping the balance in a simple stand for the development of balance (Indriastuti, 2019).



At the initial learning stage, we purposefully used static exercises for the formation and development of static equilibrium (on legs), long in time, associated with the first training sessions with numerous and varied tasks for the development of static equilibrium endurance. Our many years of pedagogical experience has shown that in order to master the technique and maintain balance, it is necessary from the first classes to form a long static balance on the legs in different starting positions, as well as in the stand, i.e. bring up static equilibrium endurance (Malyarenko, 2014).

Our system detects and determines on which support leg it is convenient to stand and which side, aided by the simulators used in it. The tasks of the equilibrium development system are based on its components and are associated with great muscular tension. All this requires bringing up the specific static endurance of balance on the legs in different initial positions (IP) in order to preserve it. The balance on the left, and then on the right leg and in the pose, the data IP are unusual conditions for the performance of motor coordination tasks by students, causing significant tremor of all muscle groups of the legs, which makes it much more difficult to control movements. When using the system, students acquire a richer and more diverse motor experience, they more easily extrapolate movements in complicated conditions, have higher mobility of the nervous system with risky coordination actions and overcoming themselves (Hirtz, 2014).

### **3. RESEARCH RESULTS**

In diverse situations in the workplace, in everyday life, there are increased requirements for physical fitness and coordination of movements (Vilensky, 2014). The most effective and affordable way to form effective physical fitness and coordination of movements in physical education classes was able to identify, define and substantiate using preparatory means for passing the control standards.

The process of formation of physical fitness for the recovery of students in physical education classes at the university was carried out under the condition: determining the essence of developing students' physical fitness in physical education classes as a harmonious combination of physical qualities, maintaining balance in static postures, controlling movement in three-dimensional space (spatial coordination), fast and timely motor response in the implementation of the motor act (reflexometry); the use of special tools for the development of physical fitness and coordination of student movements in physical education classes; the effectiveness of the development of physical qualities and coordination abilities to control the body in space in five active points of the anthropological structure of the body; combinations of theoretical knowledge and means of physical culture in teaching and training classes of students for solving various motor tasks (Apanasenko, 2014). In accordance with this, the following tasks were solved:

1. Determination of the essence, structure and content of the preparatory exercises for the delivery of standards for physical culture

and the development of coordination abilities of students in physical education classes.

2. The study of the pedagogical possibilities of preparatory exercises for the delivery of standards for physical culture in the formation of coordination abilities of students in physical education classes, comparing the motor fitness and functional state of students of the control and experimental groups.

3. The substantiation of the experimental methodology for the implementation of the pedagogical possibilities of preparatory exercises for the delivery of standards for physical culture in the formation of the coordination abilities of students in physical education classes.

4. The effectiveness of the means of preparatory exercises for the delivery of standards for physical culture on the coordination abilities of students.

At the same time, the obtained data of foreign scientists on the study of physical activity of physical culture in education and sports were used; empirical: observations, questioning, interviewing, testing, individual and group conversations on the technique of controlling movements in a future profession and life, individual interests of students in sports, research and training tasks and exercises during the educational and experimental process with an assessment of their qualitative achievements in the formation of motor functions and in individual work on the principle of feedback (teacher-student) (Geppert, 2012).

As a result of the study, a system of preparatory exercises for passing physical education standards was developed, possessing a coordinating and developing orientation, and a methodology for training sessions that ensure the effective formation of physical fitness and coordination abilities in the pedagogical process of students' physical education. Inclusion in the physical education of students of preparatory exercises performed with open and closed eyes, which provides a high level of formation of coordination and physical abilities in physical education classes. The pedagogical possibilities of preparatory exercises for the delivery of standards for physical culture in the formation of student coordination abilities are determined.

In the training process, a natural relationship was revealed: the effective positive impact of preparatory exercises for passing physical culture standards on the formation of students' coordination abilities in a pedagogical experiment, which is the basis for the inclusion of these exercises in the process of physical education to accomplish the tasks of forming students' coordination abilities in the classroom physical culture (Aronson, 2013). To determine the identity of coordination abilities and physical fitness of the observed groups of students, as well as the adequacy of teaching methods, an ascertaining experiment was conducted, the results of which are presented in Table 1.

<b>Indicators</b>	<b>Control group (CG) (n = 50)</b>	<b>Experimental group (EG) (n=50)</b>	<b>P</b>
CSi (integrated indicator), mm	24,83±0,73	26,20±0,97	>0,05

KSo with open eyes, mm	14,76±0,98	17,90±1,18	<0,05
KSz with closed eyes, mm	33,56±1,66	30,69±1,85	>0,05
KSpo after standard load with open eyes, mm	19,74±1,28	19,60±1,17	>0,05
KSpz after standard load with eyes closed, mm	29,98±1,49	33,11±1,86	>0,05
Static coordination (SC), with (Romberg's test)	84,36±0,30	83,74±0,35	>0,05
Sensitivity of the vestibular analyzer (NDA), (Yarotsky's test)	82,08±2,32	76,60±3,11	>0,05
Reflexometry, cm	18,40±0,42	19,30±0,49	>0,05
Jump height from the spot, cm (according to Abalakov)	52,38±0,87	52,7±1,19	>0,05
The length of the jump from the place, cm	197,98±3,25	211,14±2,21	<0,05

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Table 1: Indicators of motor functions, reflecting the coordination abilities and physical qualities of students

As can be seen, the parameters of spatial and static coordination, the sensitivity of the vestibular analyzer, reflexometry and jump height

between students conventionally CG and EG did not differ ( $P > 0.05$ ) (Luca, 2013). The difference was significant only in terms of the long jump and the CSO (with open eyes) at  $P < 0.05$  (Table 2). Taking into account the ascertaining experiment, two equivalent groups were formed: the control (CG) and the experimental (EG), the functional model and the basic pedagogical conditions for designing the experimental methodology for the formation of physical fitness and coordination abilities (COP) of students were outlined (Spigel, 2012). The results of the main experiment (Table 2) confirmed the effectiveness of the used preparatory exercises for passing standards in the development of CS and physical qualities in physical education classes of students (Blume, 2013).

First of all, in the EG, a significant ( $P < 0.001$ ) improvement in the integral index was revealed, reflecting the clarity of interaction between all sensory systems and the level of inter- and intramuscular coordination of the motor apparatus. This increases the closeness of the relationship, calculated by correlation analysis. If before the start of the experiment, the dependency values were in the range:  $r = 0.157-0.238$  ( $p > 0.05$ ), then at the end they were  $0.264-0.562$  ( $p > 0.05 - p < 0.05$ ). Overall, the quality improvement was 28.0% ( $p < 0.001$ ) (Hugo, 1899).

In the same group (EG), similar indicators after the standard load significantly increased (up to 21.1%;  $p < 0.001$ ) in contrast to the control group. After performing the standard load, the improvement of this indicator compared with the initial level was 28.3% ( $P < 0.001$ ). The sensitivity of the vestibular analyzer before and after the

experiment differed by 13.28% ( $P < 0.001$ ). In the control group by 5.5% ( $P < 0.05$ ), with the least development effectiveness of this quality. The speed of the motor reaction in the EG improved by 15.85% ( $P < 0.001$ ). In the control group, no significant changes occurred ( $P > 0.05$ ) (Loosch, 2010).

Indicators	Experimental group (EG - 50 people)				Control group (CG - 50 people)				The difference in outcome between the EG and the CG	
	before exp.	after exp.	$\bar{X}_1 \pm x_1$	P	before exp.	after exp.	$\bar{X}_2 \pm x_2$	P	$X_2 - X_1$	P
CSi (integrated), mm	26,20 ± 0,97	18,84 ± 0,7	28,09	<0,001	24,83 ± 0,73	24,91 ± 0,66	00,32	>0,05	6,16	<0,001
KSo with open	17,90 ± 1,18	14,68 ± 0,85	17,98	<0,001	14,76 ± 0,98	13,86 ± 1,08	77,45	<0,05	0,84	>0,05





The sensitivity of the vestibular analyzer, sec	76,60 ±3,11	86,78 ±1,4	13,28	<0,00	82,08 ±2,32	86,60 ±1,53	55,50	<0,05	0,09	>0,05
Reflexometry, cm	19,30 ±0,49	16,24 ±0,43	15,85	<0,00	18,40 ±0,42	18,54 ±0,43	00,76	>0,05	3,45	<0,01
Jump height, cm	52,7 ±1,19	57,78 ±1,03	9,63	<0,00	52,38 ±0,87	52,02 ±0,84	00,68	>0,05	4,29	<0,00
Jump length, cm	211,1 ±4,2	219,1 ±2,0	33,77	<0,00	197,9 ±3,2	197,6 ±2,53	0,19	>0,05	6,49	<0,00

Table 2: Indicators of coordination abilities and physical qualities of students at the final stage of the formative experiment (X1-X2 in%, EG = 50 people; X3-X4 in%, CG = 50 people).

Legend: 1 - CSi - integrated indicator, mm; 2 - CSo - with open eyes, mm; 3 - KSz - with eyes closed, mm; 4 - KSpO - after standard load with open eyes, mm; 5 - KSpz - after the standard load with eyes closed, mm; 6 - SC - statistical coordination, s; 7 - NDA - sensitivity of the vestibular analyzer, s; 8 - reflexometry, cm; 9 - jump height, cm; 10 - jump length, cm (Malina et al., 2011). The final analysis of the final results between the experimental and control groups of students

on CSi revealed a high degree of development in the EG at  $t$  6.16 ( $p < 0.001$ ). The most difficult conditions for the coordination of movements with closed eyes - KSz and KSpz - after the standard load at  $t$  4,43 ( $p < 0,001$ );  $t$  3.82 ( $p < 0.001$ ) and 3.27 ( $p < 0.01$ ) confirmed a high level of improvement in the development of sensory (sensitive) and precision motor functions in students of the experimental group (Marlin, 1987).

#### **4. CONCLUSION**

In the modern practice of physical education of students, there are no scientifically based approaches to the use of preparatory exercises for passing standards for physical culture and auxiliary exercises, which are effective means of developing coordination abilities of a number of motor skills and physical fitness in general, especially in the educational process. The data of the ascertaining experiment testify to the identity of the level of physical fitness and coordination abilities of students from the control and experimental groups. The exception is the parameters with open eyes and sensitivity of the vestibular analyzer.

The obtained results formed the basis for the development of an experimental methodology that determines the structure and content of preparatory exercises for passing the standards for physical culture in physical education of students, the development of specific coordination motor abilities. A system of preparatory exercises for the

delivery of standards for physical culture and auxiliary exercises, methods of their application, ensuring the development of physical fitness, coordination abilities and physical qualities of students in the process of learning in high school in physical education and sports. A functional model of development and assessment of the student's coordination abilities has been created, with the help of which the targeted formation of the students' motor and functional potential and physical activity is ensured. Coordination of movements with closed eyes - KSz and KSpz - after the standard load at  $t$  4,43 ( $p < 0,001$ );  $t$  3.82 ( $p < 0.001$ ) and 3.27 ( $p < 0.01$ ) confirmed a high level of improvement in the development of sensory (sensitive) and precision motor functions in students of the experimental group.

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