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Complex correction of coordination abilities of female volleyball players with degree I overweight

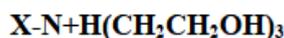
According to the World Health Organization [1], recent years have seen an increase in the prevalence of obesity among people of different age groups worldwide. Obesity is associated with numerous impairments affecting various organs and physiological systems at the level of the whole organism. Consequently, the prevention and treatment of excess body weight have become a problem of global importance. In this regard, the Russian Federation is no exception, as demonstrated by Academician of the Russian Academy of Sciences I.I. Dedov and colleagues [2]. There is broad consensus that obesity is largely a consequence of reduced physical activity (hypodynamia). Accordingly, increasing physical activity represents one of the key approaches to addressing this problem. At the same time, the concepts of maladaptation (adaptation syndrome, stress syndrome) developed by G. Selye [3], as well as the theory of functional systems proposed by P.K. Anokhin [4], remain relevant. These theoretical frameworks formed the methodological basis of the present study. In addition, a comprehensive approach was employed that combines a chemical (pharmacological) stimulus derived from the main research area—namely, the pharmacology of protatranes—with a physical stimulus in the form of training.

The study investigates the effects of the developed program on agility, balance, and other essential coordination abilities required for successful volleyball performance in 17-18-year-old female students with stage I obesity. Changes in coordination parameters before and after the intervention were analyzed.

Keywords: stage I obesity, intervention, Tricevit dietary supplement, students, 17-18-year-old females, motor activity, motor coordination, intervention

Introduction

According to WHO estimates, overweight occurs in 25–30 % of adults and 12–20 % of children worldwide [1]. Russian studies conducted at the Institute of Clinical Endocrinology revealed that over 2.7 million adolescents (12–17 years) in Russia are overweight, with approximately 500,000 of them suffering from obesity [2]. Given the importance of public health, the Government of the Russian Federation encourages the active participation of all segments of the population in health-enhancing physical activity [5]. Physical education has a comprehensive impact on the human body, which functions as a complex system with multi-level regulation. In pedagogical practice, special attention is paid to maintaining the health of the younger generation, including students with various health and physical development disorders. It is important to develop in students a conscious desire to improve their health, actively using health, pedagogical, and medical methods. In particular, volleyball, being the most widespread and accessible sport and physical activity in the world, can serve as an effective tool for preventing insufficient physical activity and obesity, including improving coordination skills [6]. Therefore, there is a need to develop innovative and effective approaches to restoring impaired coordination skills in overweight individuals. In this context, the drug trecrezan, which has a broad spectrum of biological action [7, 8, 9] has attracted particular attention. Trecrezan is the progenitor of a new class of biologically active compounds—protatranes [10, 11], which obey the formula:



The chemical base of Trecrezan is oxyethylammonium methylphenoxyacetate, which is available as a powder and packaged in 1.0 kg jars. Trecrezan follows the formula:



Results and Discussion

We present data collected from a group of girls who did not use the dietary supplement Tricevit (control group). The results of this series of studies are summarized in Table 1.

Table 1

Changes in Coordination Skills of Female Volleyball Players (Control Group)

Indicator	1-test	2-test	3-test
Overhand Tennis Ball Catching (points)	2,7±0,2	3,5±0,2*	4,3±0,2*
Pendulum-Throw-Target (points)	4,8±0,1	5,9±0,2*	8,1±0,4*
Shuttle run 4x9 (seconds)	20,1±0,1	19,1±0,1	18,7±0,1*
Right-handed tennis throw; seated, feet apart (meters)	9,1±0,2	11,5±0,3*	12,4±0,3*
Bouncing the ball on the floor, alternating hands, for 30 seconds (times)	15,7±0,4	18,7±0,5*	26,1±0,8*
Coordination and combination of movements (number of errors)	10,0±0,3	9,1±0,3*	7,5±0,2*
Cyclic exercises with cross-coordination performed with changing planes (points)	2,5±0,1	3,5±0,2	4,0±0,3*
Sequential exercises with changing planes (points)	2,6±0,2	3,6±0,3*	4,0±0,3*
Various rhythmic exercises in the frontal plane (points)	2,1±0,2	3,3±0,2*	4,0±0,4*

Note. * - $p < 0.05$ in relation to initial values.

Based on the data presented in Table 1, we can conclude that volleyball training in the control group of subjects produced positive and statistically confirmed improvements in coordination skills.

Next, we examined coordination skills in female students in the first experimental group, who twice took the dietary supplement Tricevit in combination with physical exercise. The data are presented in Table 2.

Table 2

Changes in the coordination skills of female volleyball players (first experimental group)

Indicator	1-test	2-test	3-test
Right-handed tennis throw; seated, feet apart (meters)	9,2±0,1	13,7±0,2	19,4±0,2*
Pendulum-Throw-Target (points)	4,8±0,1	6,9±0,2	9,8±0,3*
Shuttle run 4x9 (seconds)	20,1±0,2	18,1±0,1	15,3±0,1*
Overhand Tennis Ball Catching (Points)	2,7±0,1	4,5±0,1	5,7±0,3*
Bouncing the ball on the floor, alternating hands, for 30 seconds (times)	15,7±0,4	19,9±0,6	29,9±0,9*
Coordination and combination of movements (number of errors)	10,0±0,3	7,9±0,2	6,0±0,2*
Cyclic exercises with cross-coordination performed with changing planes (points)	2,5±0,1	3,8±0,2	4,3±0,2*
Sequential exercises with changing planes (points)	2,6±0,2	3,8±0,3	4,5±0,3*
Various rhythmic exercises in the frontal plane (points)	2,1±0,2	3,8±0,3	4,2±0,3*

Note. * - $p < 0.05$ in relation to initial values.

Based on the data presented in Table 2, it can be concluded that systematic use of the dietary supplement Tricevit over two courses within one academic year has a statistically significant positive effect on the coordination skills of female students. This effect is more pronounced and positive compared to changes in the control group.

In the final series of observations, we studied the coordination skills of female students belonging to Experimental Group 2. Table 3 presents the obtained data.

Changes in the coordination skills of female volleyball players (second experimental group)

Indicator	1-test	2-test	3-test
Right-handed tennis throw; seated, feet apart (meters)	9,2±0,1	13,8±0,2	21,3±0,2*
Pendulum-Throw-Target (points)	4,8±0,1	7,5±0,3	10,9±0,3*
Shuttle run 4x9 (seconds)	20,1±0,1	17,6±0,1	14,1±0,1*
Overhand Tennis Ball Catching (Points)	2,7±0,2	4,9±0,2	6,5±0,2*
Bouncing the ball on the floor, alternating hands, for 30 seconds (times)	15,7±0,4	21,9±0,3	32,5±0,5*
Coordination and combination of movements (number of errors)	10,0±0,3	6,44±0,2	4,1±0,1*
Cyclic exercises with cross-coordination performed with changing planes (points)	2,5±0,1	4,1±0,1	5,4±0,1*
Sequential exercises with changing planes (points)	2,8±0,2	4,3±0,2	5,1±0,3*
Various rhythmic exercises in the frontal plane (points)	2,2±0,2	4,3±0,1	5,5±0,2*

Note. *- $p < 0.05$ in relation to initial values.

The results obtained, presented in Table 3, indicate a significant positive impact of a comprehensive approach, including three doses of the dietary supplement Tricevit throughout the year, on the coordination characteristics of female students. Thus, the study results are logically interpreted based on the principles of the functional systems theory proposed by P.K. Anokhin and incorporate G. Selye's concept of the adaptation syndrome. It offers a comprehensive analysis of the mechanisms of the body's adaptation to changing environmental conditions, emphasizing the interconnectedness and integration of diverse physiological processes. In particular, functional systems theory allows us to analyze behavior not as a simple set of individual reflexive reactions, but as a goal-oriented activity aimed at achieving a specific beneficial result. Within the framework of the aforementioned theories, we found it possible to present our interpretation of the obtained data in the form of a diagram in Figure 1.

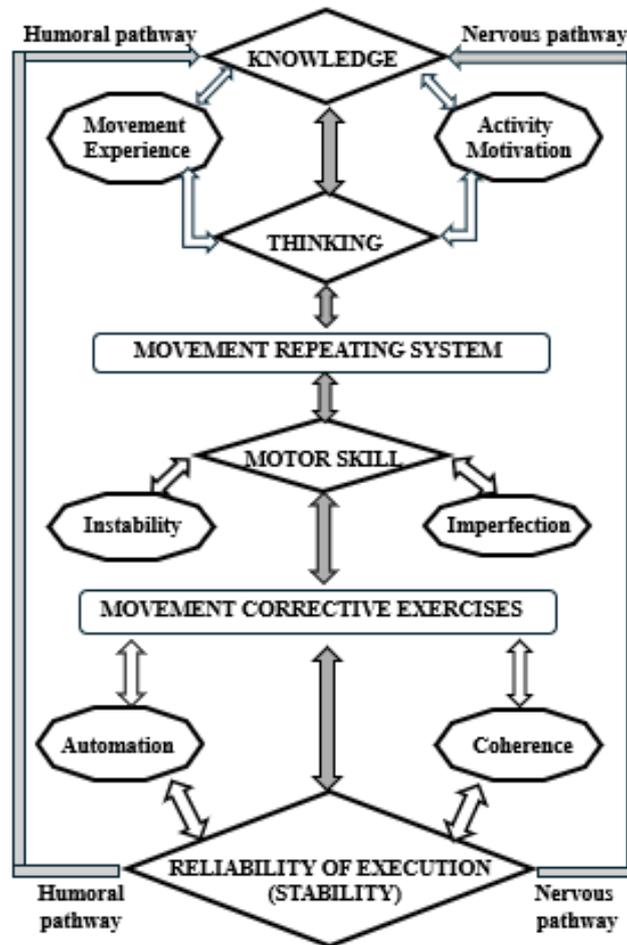


Figure 1. *Schematic diagram of the step-by-step correction of the body's coordination skills under complex influences

Notes. *- the diamond-shaped diagram indicates the key stages in the formation of a holistic behavioral act—the development of stable motor coordination; accordingly, the connections (direct and inverse) are indicated by shaded arrows. At each stage, as can be seen from the ovals, the possibility of forming additional subsystems of a particular format (meaning) is demonstrated, with the presence of the presented connections (unshaded arrows) to the key stage. Finally, this diagram, although simplified, highlights the key feedback pathways from the end point (the result of an action) to the initial stage of a behavioral act, namely the generation of a thought regarding the need to act. Thus, we believe the presented diagram indicates a multi-stage process of goal achievement, as well as the formation of a series of interconnected subsystems or multi-parameter systems of interconnected regulation. It is important to emphasize that the idea of conjugated (alien) reflexes, put forward by C.S. Sherrington (Nobel Prize!) [16], fits harmoniously into the system of maintaining homeostasis (adaptive responses). This theory, which is a significant step in the development of the theory of reflexes, provides a more complete understanding and explanation of both generally accepted and experimentally established characteristics. At the same time, in implementing physical education methods, we strictly adhered to the directives and recommendations set forth in regulatory documents, including specialized educational materials and teaching aids, which is an important component of the study.

Conclusions

1. An assessment of the dynamics of health indicators convincingly demonstrates that comprehensive correction using the dietary supplement Tricevit in combination with physical activity in female students suffering from stage I obesity demonstrates a pronounced positive effect.
2. The approach we have developed represents one of the new ways to solve the problem of obesity, which nevertheless requires further research.

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