

Original article:

The ability to rational relaxation of the muscles in children who are engaged in football taking into account their nervous system

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Abstract

Introduction: If the football lessons with children take into account their strength of the nervous system in the process of excitation, the effectiveness of such activities will be higher. **Objective:** Study of the effect of the nervous system of players on the ability to rationally relax their muscles. **Method:** 44 athlete's aged 13-14 years took part in the pedagogical experiment. 22 young footballers were engaged in the experimental methodic, which is based on the use of different components of the load, for players with a strong nervous system (11 people) the load was intense, and for players with a weak nervous system (11 people) - volume. Other 22 athletes were in the control group. **Results:** After 7 months of research, we saw a significant improvement in the ability to relax the muscles in children aged 13-14 years, who trained according to our methodic. Children who have a strong nervous system, improved performance in the test "juggling the ball" from 4.1 ± 0.8 times to 6.5 ± 1.1 times ($P < 0.05$), and players with a weak nervous system – from 3.8 ± 1.3 times to 5.4 ± 1.4 times ($P < 0.05$). In the control group, the changes were positive but unreliable ($P > 0.05$). **Conclusion:** If the lessons with children use a differentiated method, which is based on the typology of the nervous system, the performance of children will improve significantly. The use of this method will improve the technical performance of athletes and improve the quality of the training process.

Keywords: Typology; football players; nervous system; differentiated approach

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Introduction

To date, there are some studies that focus on coordination abilities. It is proved that the technical training of the athlete is his special coordination abilities^{1,2}. One of the important special coordination abilities is the ability of athletes to rational muscle relaxation^{3,4}. A favorable period for the development of this ability is the age of 13-14 years. At this age, athletes tend to master all coordination abilities. Therefore, it is easier for them to develop the ability to rational muscle relaxation in the process of performing physical exercises^{5,6}.

Differentiated approach is one of the most effective approaches in pedagogy and sport. When performing physical exercises, children are formed into groups taking into account some feature. For example, the level of technical training, growth, physical condition and some other indicators. Individual approach is also the place to be, but, it is used at an older age^{7,8}.

Proved its effectiveness and typological criterion.

Under the typology refers to the strength-weakness of nervous system for the excitation process. Some studies have focused on this approach^{9,10}. However, in most of these studies there are no specific recommendations on the methodology. And there is no such research in football.

Since there are contradictions, the purpose of the study appears - study of the effect of the nervous system of players on the ability to rationally relax their muscles.

Methods

The study was conducted in Russia, in Kirov, in a sports school – 5. The study involved young football players aged 13-14. Prior to the experiment, 44 players were divided into an experimental group (EG) and a control group (KG) by random sampling, taking into account the strength of the nervous system¹¹.

The study lasted seven months, at this time, children from KG engaged in the standard program, and athletes from EG trained by a special technique,

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which involves the differentiation of athletes into groups, taking into account the strength of the nervous system. In the course of the experiment were conducted 100 training sessions for 90 minutes each workout.

In the course of the research the following methods were used:

1) pedagogical experiment (determination of the strength of the nervous system in the initiation process, the determination of the level of development of the capacity for rational relaxation of the muscles);

2) methods of mathematical statistics

1. The strength of the nervous system was determined by the method of «Tapping test».

One A4 page is divided into six squares. On a signal - athletes put points in one square. Every 5 s they have to go to the next square. You need to quickly put as many points in each square. The exercise ends after 30 seconds.

The result: the number of points in each square, to build a schedule of performance, to determine the strength of the nervous system, 1 attempt¹³.

2. The ability to rational muscle relaxation was determined by the test «juggling the ball»

The task of the athlete was to touch the foot in the air on the soccer ball, knocking him above his head. The ball should not fall on the floor. 2 attempts.

The result: maximum a number of times¹⁴.

All players of EG and KG after warm-up carried out exercises on development of coordination abilities within 25-30 minutes.

In the process of training used methods for exposure – repeated, varied, gaming and competitive. Teaching methods – introducing new exercises, increasing complexity of the studied exercise, change the speed of the exercise¹⁵.

The stress components are the main difference between the EG and from KG. The players in KG load was the same.

The players in the EG were differentiated into groups taking into account typological peculiarities of manifestations of properties of the nervous system. The difference was in the load, for a strong nervous system it was intense, and for children with weak – volume^{9,10,16}.

Intensity is an increase in the number of exercises, and less rest. Volume - the number of repetitions and

rest.

Athletes with a strong nervous system performed the exercise for 20-30 seconds, and the weak - for 30-40 seconds.

In both subgroups, the rest time lasted until full recovery, the nature of the rest - passive.

Number of reps on several exercises have football players with a strong nervous system 2-4 times, and have weak – 4-6 times. The number of episodes 4-6 in a strong and a weak 5-8.

Statistical and mathematical processing of the results of the study was carried out using the parametric criterion (t-student). Correlation analysis was performed using the BioStat2009 program. The result was significant at $P < 0.05^{17, 18}$.

Ethics approval and consent to participate

This research was conducted in compliance with the needed research ethics. In addition, consent for participation was obtained from the participants before the beginning of their involvement in the study. All data were recorded and analyzed anonymously.

Results

Prior to the study, the Players of EG and KG performed a control test «juggling the ball», which shows the level of development of the ability to rational muscle relaxation. No significant differences between the indicators of EG and KG players were revealed ($P > 0.05$).

The results in the test «juggling the ball» in all subgroups (from 3,8 to 4,2 times) correspond to the low level of development of the ability to relax the muscles of players of 13-14 years (14).

Indicators of the capacity for rational relaxation of the muscles of the players 13-14 years is presented in table 1.

Footballers KG improved their performance, but only slightly. In children with a strong nervous system performance improved from 4.2 ± 1.4 times to 4.7 ± 1.3 times ($P > 0.05$), in football players with a weak nervous system from 4.0 ± 0.8 times to 4.4 ± 1.1 times ($P > 0.05$).

EG in athletes who were engaged in the same procedure, but with differentiated load typologies, the nervous system indicators have improved significantly (reliably). In football players with strong nervous system performance improved from 4.1 ± 0.8 times to 6.5 ± 1.1 times ($P < 0.05$), and in football players with weak nervous system – from 3.8 ± 1.3

Table 1 Indicators of the ability to rationally relax the muscles of football players of 13-14 years (M ± m)

Indicators	The strength of the nervous system	KG			EG			P (2-5)
		Before	After	P	Before	After	P	
		1	2	3	4	5	6	
juggling the ball (Number of times)	Strong	4,1±0,8	6,5±1,1	t=5,6 P<0,05	4,2±1,4	4,7±1,3	t=0,8 P>0,05	t=3,1 P<0,05
	Weak	3,8±1,3	5,4±1,4	t=2,21 P<0,05	4,0±0,8	4,4±1,1	t=0,9 P>0,05	t=2,2 P<0,05

After the experiment in both groups there were positive changes in the control test «juggling the ball».

times to 5.4±1.4 times (P<0.05). Such indicators correspond to the high level of development of the ability to relax the muscles of players for the age of 13-14 years¹⁴.

Discussion

Coordination abilities of a player are his technical training. Types of coordination abilities are diverse. For example, there are basic, specific, which include many other indicators. Primary school age is a great age to form coordination. The ability to relax muscles rationally in children aged 13-14 plays an important role in football^{1-4,19}. Research confirms it. Usually, when performing physical exercises, players are differentiated according to different characteristics, such as the player's technique, his height or weight^{7, 8, 20}. Yes, these studies show the effectiveness of the differentiated approach.

The results of the pedagogical experiment confirm the effectiveness of the differentiated approach, which is based on the strength of the nervous system of children. For the first time, pedagogical research was conducted on children involved in football. Despite the fact that some studies in the field of typology are already available^{9, 10, 16}.

It should be clearly understood that the load for all athletes cannot be the same. Our study showed that the effective load for players 13-14 years old with a strong nervous system will be intense, and for a weak nervous system - volume.

For the first time, specific recommendations on training and loads for players who differ in typology are given.

Conclusion

The study emphasizes the importance of using a differentiated approach in the training of athletes in playing sports. The efficiency of using the typological parameter of the nervous system as a criterion for differentiating athletes into groups is proved. Athletes from EG at the end of the study showed much better performance in the test «juggling the ball» (P <0.05) than children KG (P >0.05). Using a differentiated approach, which is based on the strength of the nervous system, will significantly improve the technique of players and increase their results in the game.

The results of the study can be used by coaches and teachers of ordinary and sports schools in the classroom with children. The study itself is promising, as it opens up new opportunities to study the impact of coordination on the various processes of children.

Competing interests

The author declares that he no competing interests.

Authors' Contribution: Georgiy Polevoy contributed the conception, design, data collection and prepared the first draft of the manuscript, revised and checked closely the proposal, the analysis and interpretation of the data of the article and also read and approved the final manuscript.

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