

II. ТЕОРІЯ І МЕТОДИКА ПІДГОТОВКИ СПОРТСМЕНІВ

SPORT GAMES AND CYCLICAL SPORTS IMPACT ON CARDIOVASCULAR SYSTEM OF 11–14 YEARS OLD BOYS

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Annotation

The aim – to determine the sport games and cyclical sports impact on the features of the dynamics in functional parameters of the muscles and cardiovascular systems in boys of the age groups of 11-14 years old. The contingent of this study was 257 boys aged 11-14 years who were divided into three groups: non-athletes ($n = 85$), cyclical sport athletes ($n = 89$) and sport games players ($n = 83$). Were assessed their cardiovascular (heart rate) indices.

Were found that sport games training sessions are an important external factor, affecting the functional parameters of accelerated changes in cardiovascular system (CS) of the 11-13 years old age groups. The determinant influence of endogenous factors on child's growth and development particularly increase at the age of 13-14 years, resulting significant changes in CS indices improvement and non-athletes children for the following characteristics almost equal to peers engaged in sports.

INTRODUCTION. Maturation processes determine an interaction of inherent (endogenous) and acquired (exogenous) factors [1]. The significant role in this interaction plays the exogenous factors, i.e., physical activity, the nature of physical load and other physical load characteristics [10]. An activity of cardiovascular system (CS) is exceptionally important in the chain of adaptive mechanisms [13]. Children choose a specific sport (event), and regularly attended training sessions for a long time, becomes a significant factor in the prevalence of the nature of physical exercises [7]. This paper examines the different sports of long-term training effects on boys' CS.

In the long-term multiple physical load changes heart and vascular system adaptation [8]. Regular physical load leads to an increase of CS functional capacity. Cardiac functional capacity is often the body's adaptive potential restricting factor therefore cardiac adaptation to maximal physical load is one of the key conditions that determine the overall adaptation of the organism in its environment. While the growth of organism during the first 10-15 years, the main importance of increasing the employability of heart during exercise has heart rate (HR). CS changes causes activation of different physiological adaptation patterns by the physical load in different age stages [11].

The aim – to determine the sport games and cyclical sports impact on the features of the dynamics in functional parameters of the

cardiovascular systems in boys of the age groups of 11-14 years old.

MATERIALS AND METHODS. The study involved 11-14 years old boys, Lithuanian high school and sports school pupils (healthy, do not have bad habits). In this study the contingent was 257 boys 11-14 years of age. All subjects were divided into three groups: non-athletes ($n = 85$), cyclical sports athletes – runners ($n = 89$) and representatives of sports games – basketball, handball, football ($n = 83$) (Table 1). This study involved the boys going to the chosen sport not less than 2 years.

The study carried out in Kinesiology laboratory, Lithuanian Academy of Physical Education, in spring 2006 (April/May), at the same time of day. Boys, two days before the testing did not performed all-out exercise.

Local ethical committee approved this study protocol. The subject underwent a dosed exercise test, i.e. Rouffier test (30 squats per 45 seconds) and all-out exercise tests, i.e. a 30 seconds duration vertical jump test [9]. A computerized ECG analysis system "Kaunas-load", developed at the Kaunas Medical University Institute of Cardiology, was employed for 12 synchronous lead ECG recording and analysis. The changes in HR as a sum in 12 leads were analyzed.

In order to compare the data was determined arithmetic mean (\bar{x}), average standard deviation (SD). Due to evaluate the significant differences of values was used one-way analysis of variance – ANOVA (Student's test summary of several independent samples). Were used the follow-



Characteristics of subjects

Subjects age	Sport event	Stature, cm	Body mass, kg
11 years	Non-athletes (n=22)	153,3± 2,2	45,6± 3,4
	Cyclical sport athletes (n=22)	147,5± 1,3	36,3± 2,0
	Sport games players (n=21)	152,4± 1,3	42,4± 2,0
	Mean value	151,0±8,1	41,4± 12,4
12 years	Non-athletes (n=18)	158,6±1,8	46,6± 1,8
	Cyclical sport athletes (n=20)	159,1± 2,3	46,6± 2,5
	Sport games players (n=20)	157,6± 2,5	46,6± 2,7
	Mean value	158,4± 9,8	46,6± 10,4
13 years	Non-athletes (n=25)	165,7± 2,4	52,5± 2,1
	Cyclical sport athletes (n=24)	165,2± 1,7	50,1± 2,0
	Sport games players (n=22)	168,7± 1,8	54,2± 1,7
	Mean value	166,5± 9,7	52,2± 9,6
14 years	Non-athletes (n=20)	173,9± 1,6	63,5± 2,3
	Cyclical sport athletes (n=23)	172,0± 1,8	55,5± 1,8
	Sport games players (n=20)	172,6± 1,7	57,7± 2,1
	Mean value	172,8± 7,8	58,7± 9,9

ing statistical significance levels: $p < 0.05$ – a reliable, $p < 0.01$ – a highly reliable, $p < 0.001$ – particularly credible conclusion.

RESULTS. Non-athletes boys, sport games players and cyclical sport athletes aged 11-14 years the HR dynamics after Rouffier and 30 s vertical jumping tests presented in Figure 1. In the stages of 11, 12 and 14 years of age were not found statistically significant differences between athletes and non-athletes groups. Also 13 years old non-athletes boys and cyclic sports athletes HR results did not differ. However, our analyzed data of these both groups throughout the study exhibited statistically significant differences compare it to the sport games players.

DISCUSSION. The most sensitive age to the external influences is of 11-14 years old period, therefore the investigations of this age boys engaged in sports may reveal the complex interaction of the inherent and acquired (endogenous and exogenous) factors.

In this work has been studied and evaluated sport games and cyclical sports impact on the features of the dynamics of body's functional state in boys of the age groups of 11-14 years old. It is shown that the physical load nature (partially regulated, specific for sport games activities and strictly regulated physical load, specific to cyclical sports training sessions) differently affects the features of CS in growing and rapidly evolving body.

The comparison of the obtained data showed that the lowest HR values were in 13 years old sport games players group and significantly differed from non-athletes and cyclical sports athletes. Thus lower HR values show that the boys attending sport games trainings exhibit slower heart rate – longer diastole (heart relaxation), faster mobilization of CS at the onset of exercise. This confirms the opinion of the other authors [2], specific exercise used in the sport games training sessions, partially regulated nature of physical load,

has an impact on the adaptation's changes.

A lot of research works has been done in order to assess the patterns of the growth and development [6], finding the most appropriate physical load [3]. Generalization of other scientists and the results of this study suggest that interaction of the external and internal factors determine the CS functional capacity development and its expression during exercise in the 11-14 years old boys. Variable-intensity physical load, specific to exercises of sport games training sessions, is a significant external factor affecting the accelerated change of cardiovascular functional parameters at the age of 13 years. However, endogenous factors, especially in 13-14 years age groups are strongly influenced by the CS, so that even non-athletes boys' CS functional parameters are improving rapidly, and according to these indices non-athletes children almost equal to peers engaged in sports. These results can be explained by other authors [7] conclusions, where diverse directions physical loads, creating a different external and internal stimuli relations and leads

to different adaptation properties. Thus, because of the regular physical loads in sport games players' training sessions the functional state of CS improves faster.

Due to summing-up these results it is necessary to take into account the fact that the athletes' physical maturity and functional preparedness indicators are the outcome of the selection and adaptation dynamics [12]. Also, our study confirms other researchers [4, 5] findings that sports activities unquestionably have an impact on the capacity of the cardiovascular system and skeletal muscles.

CONCLUSION. Sport games training sessions are significant exogenous factor, affecting the functional parameters of accelerated changes in cardiovascular system of the 11-13 years old age groups. Decisive influence of endogenous factors on child's growth and development significantly increases at the age of 13–14 years due to changes of important cardiovascular system indices improvement and non-athletes children become almost equal to the athletes contemporaries considering these parameters.



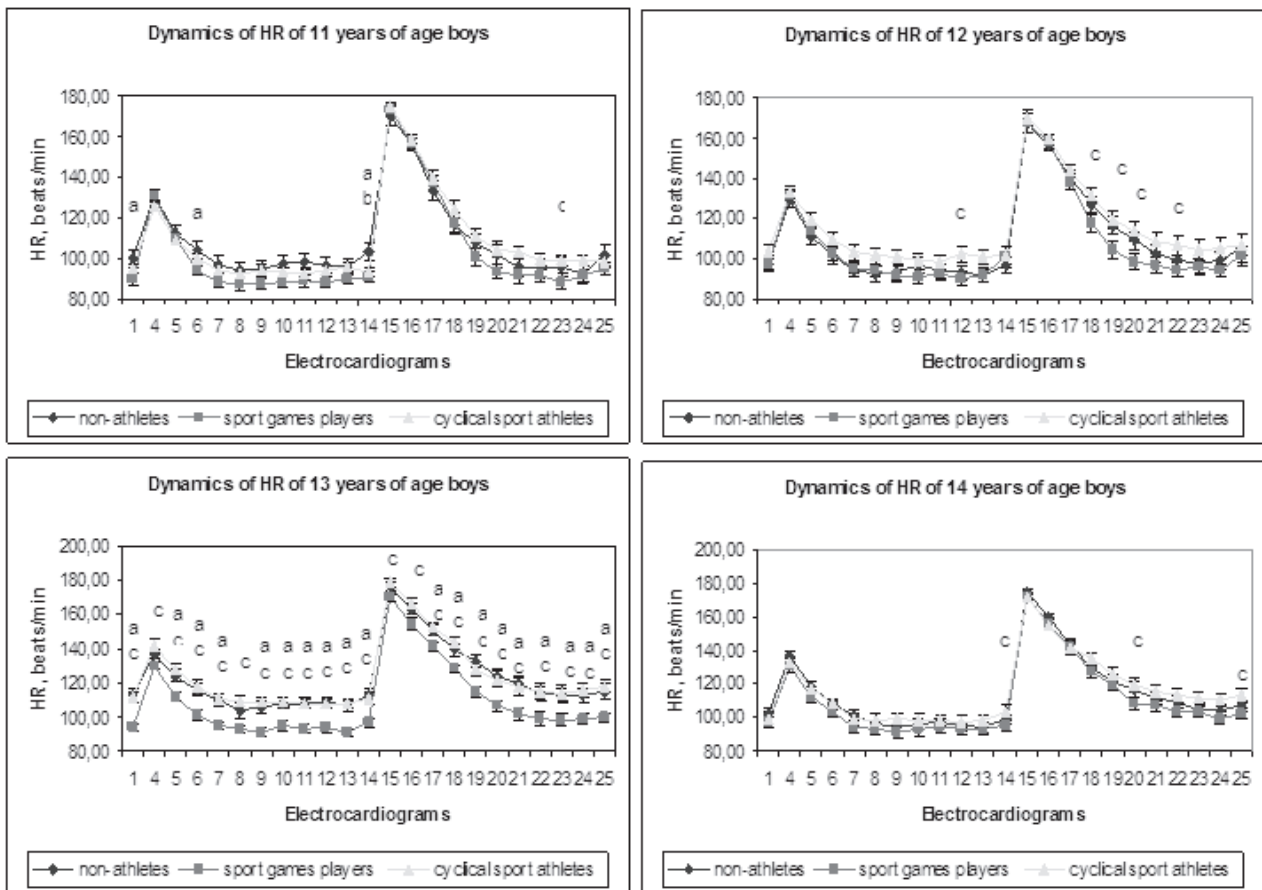


Fig. 1. HR dynamics of 11 to 14-year-old non-athletes, sport games players and cyclical sport athletes during Rouffier test and 30 s vertical jumping test. Note. The difference between non-athletes and sport games players – a, cyclical sport athletes and non-athletes – b, sport games players and cyclical sport athletes – c – statistically significant when $p < 0,05$. 1 ECG – before load; 4 to 14 ECG – recovery after Rouffier test; 15-25 ECG-recovery after 30 s vertical jumping test.

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