

## II. ТЕОРІЯ І МЕТОДИКА ПІДГОТОВКИ СПОРТСМЕНІВ

### SPORT GAMES AND CYCLICAL SPORTS IMPACT ON MUSCLES 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 muscle strength (arm levators, femoral flexors, calf extensors and flexors, and forearm extensors and flexors) indices.

The improvement of muscle capacity indices depend on the nature of physical load: muscle strength indices more increased in cyclical sports group.

**INTRODUCTION.** Generalized other scientists epidemiological studies highlight the positive effects of physical exercise on the working capacity and functional state of the muscles system [4]. However, the specificity of the exercise selection is relevant to: sports games (partially regulated physical load) or cyclical sports (strictly regulated physical load) has greater impact on development of the muscles and CS features? 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 [8]. This paper examines the different sports of long-term training effects on boys' muscles.

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

Muscle strength was measured in boys by hand dynamometer «Nicholas». With «Nicholas» hand power measurements device, the maximum force required for the isometric muscle contraction mode is obtained when the resistance caused by the research investigator appear. The characteristic of the dynamometer is a measure of strength between 0 and 199.9 kg, therefore it is possible to evaluate the major muscles strength. The device is placed between the investigator's arm and investigative arm. The investigator's pressure force through the dynamometer is aimed at the investigative upper limb. Were measured arm levators and femoral flexors strength, calf extensors and flexors strength and forearm extensors and flexors strength.

In order to compare the data was determined arithmetic mean ( $x$ ), 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 following statistical significance levels:  $p < 0.05$  – a reliable,  $p < 0.01$  – a highly reliable,  $p < 0.001$  – particularly credible conclusion.

**RESULTS.** Comparing the results of dynamometry in four age groups (11, 12, 13, and 14) was measured in our selected groups of muscles on the right and left side (arm levators,



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

femoral flexors, calf extensors (Fig. 1) and flexors and also forearm extensors and flexors (Fig. 2)), and was found that the best results achieved by cyclical sports athletes. The weakest results were obtained in non-athletes boys. Observed arm levators strength results show that in all age groups was statistically significant difference between non-athletes and cyclical sports athletes' strength. 11 years old boys these parameters vary among the three groups of subjects. Measurements of femoral flexors strength statistically significant differences were not found only for 12 years of age groups, 11 and 13 years of age the differences found by comparing cyclical sports with non-athletes and sport games players. The examination of the calf extensors strength were established that between 11-13 year old boys best results belonged to cyclical sports athletes, as well as the calf flexors strength – between 11 and 12 years boys.

Measurements of forearm flexors strength in 11-14, as well as the best results achieved in cyclical sports groups, and statistically significant difference compared with the results of non-athletes and sport games players groups. The same situation was observed in the evaluation of forearm extensors strength right side and left side of 11 and 13 years of age groups.

Dynamometry assessments between the groups showed that the muscle strength of the cyclical sport athletes is greater than non-athletes and sport games players. Statistically significant differences between boys were identified in all age groups in assessment of both: right and left sides.

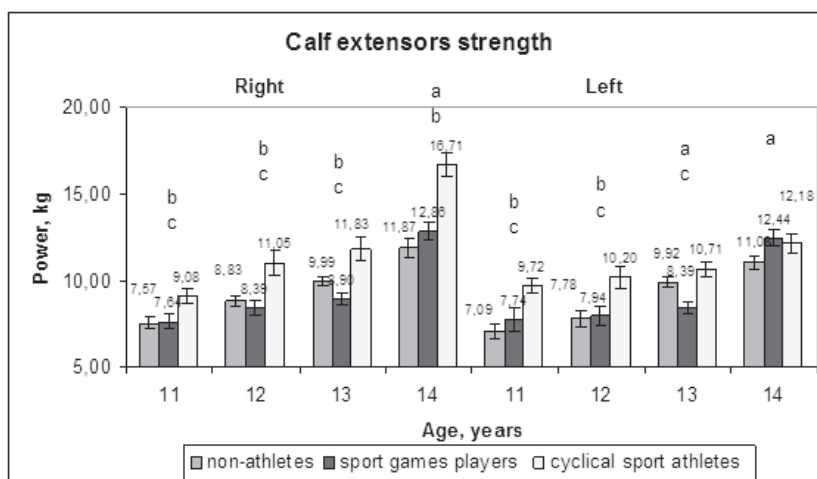
**DISCUSSION.** The body's reaction to physical exercises, which belong to the group of the external factors, affecting the body's growth and development features, has impact on the functional and morphological changes in the systems [3]. In this work has been studied and evaluated sport games and cyclical 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 in growing and rapidly evolving body.

Dynamometry assessments between the groups showed that muscle strength is more specific to cyclical

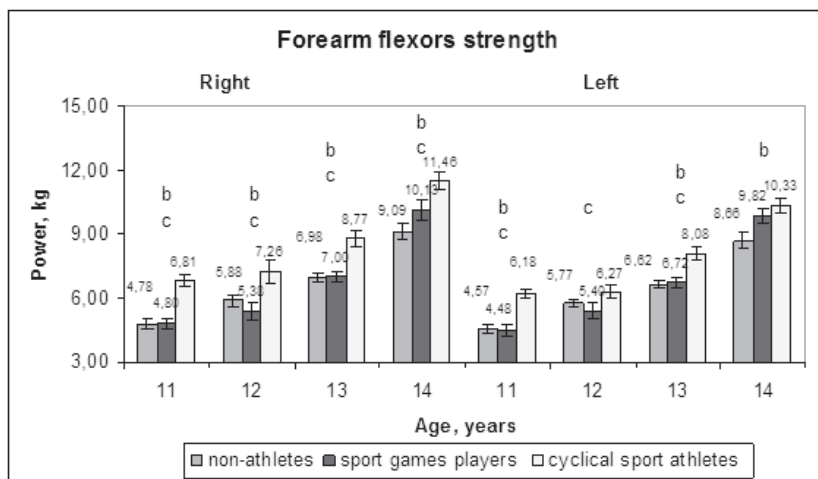
sports athletes, but non-athletes boys nor players. Statistically significant differences between boys were identified in all age groups, in assessment of right and left sides. Muscle capacity assessment data confirmed a number of other authors claiming that exercise affects the growth and development processes [7].

A lot of research works has been done in order to assess the patterns of



**Fig. 1. The results of calf extensors strength in non-athletes, sport games players and cyclical sport athletes. 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.**





**Fig. 2. The results of forearm flexors strength in non-athletes, sport games players and cyclical sport athletes. 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  $p < 0,05$ .**

the growth and development [6], finding the most appropriate physical load [1]. Generalization of other scientists and the results of this study suggest that interaction of the external and internal factors determine the features of the muscles capacity development and its expression during exercise in the 11-14 years old boys. Precisely regulated physical load, specific to cyclical sports is an external factor affecting the boys' muscle strength parameters of 11-14 years of age.

These results can be explained by other authors [8] 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 cyclical sports training sessions the functional state of muscular system 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 [9]. Also, our study confirms other

researchers [2, 5] findings that sports activities unquestionably have an impact on the capacity of the skeletal muscles.

**CONCLUSION.** The improvement of muscle capacity indices depends on the nature of physical load: muscle strength indices more increased in cyclical sports group.

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