

## PHYSICAL DEVELOPMENT FACTOR STRUCTURE AND SPECIFIC PERFORMANCE OF 15-16 -YEAR –OLD CYCLISTS FROM BULGARIA

*Original scientific paper*

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### **Abstract**

*Unfortunately, in Bulgaria there is still not established methodology for objective measure of basic physical characteristics and specific motor abilities skills as a criterion from assessing athletes' development in cycling and help predicting development of sport result. The displayed factors determine the features which should be mainly developed during studied period. The aim of the following study is to reveal the factor structure and identify the main factors of physical development and specific sport performance in 15-16-year-old cyclists (boys) from Bulgaria. The study sample was comprised from 20 boys, training cycling in Bulgaria cycling clubs. Examiners were tested in physical development (2 variables), level of physical preparedness (7 variables), and level of specific technical and tactical preparedness (5 variables). Obtained results were analyzed using statistical procedures, particularly testing of variance and factor analyses. Four different factors were isolated. The displayed factors determine the features which should be mainly developed during studied period.*

**Keywords:** *cycling, factor structure, development, boys*

### **INTRODUCTION**

The effectiveness of process of training depends from many different internal and external factors (Zeljaskov & Dasheva (Желязков & Дашева), 2011). Factor structure disclosure and identifying the main factors of physical development and specific performance is a task of particular importance (Borukova (Борукова), 2013). Its solution allows to quantify the influence (importance) of each physical development and specific development sings because it is more profitable to work more on qualities represented by the performance of greater importance than on those with littler influence on the sport result (Zenov (Ценов), 2015).

Unfortunately, in Bulgaria there is still not established methodology for objective measure of basic physical characteristics and specific motor abilities skills as a criterion from assessing athletes' development in cycling and help predicting development of sport result. Several studies are done examining different aspects of training process in cycling with young athletes, including development of physical abilities (Kolev & Ilinova (Колев & Илинова), 2006); morphological dimensions (Toteva (Тотева), 2005); system of selection (Kolev (Колев), 2012; 2016; Kolev, Doichev & Ivanov (Колев, Дойчев, & Иванов), 2008)

By this logic, using factor analysis can be identified certain essential criteria for successful sport selection for athletes training cycling and help optimization of educational and training process during future training sessions with young cyclists (Doichev (Дойчев), 2019).

The aim of the following study is to reveal the factor structure and identify the main factors of physical development and specific sport performance in 15-16-year-old cyclists (boys) from Bulgaria.

### **METHODS**

Subject of the following study is the system for sport selection and orientation and initial training of young cyclists.

We analyze the physical development, the level of physical preparedness and technical and tactical abilities of young cyclists from the Republic of Bulgaria.

Respondents of the study are 20 boys, training cycling in Bulgaria cycling clubs.

For the purposes of the study we implemented the following test methods:

- theoretical and logical analysis of specialized scientific literature;
- anthropometry;
- sport-pedagogical testing;

The applied test battery includes 15 indexes divided into the following characteristic groups:

- assessment of physical development – 2 indexes (incl. BMI – Body Mass Index);
- assessment of physical preparedness level – 7 indexes;
- assessment of specific technical and tactical preparedness level – 5 indexes.

The obtained results were subject to specific mathematical and statistical processing through variance and factor analysis.

### **RESULTS AND DISCUSSION**

The results from the factor analysis from the baseline testing with the respondents (aged 15-16-year-old) are presented as a part of special factor matrix (Table 1). As stated above, in this age group, after application of factor analysis procedures we outlined four main factors which generally explain high percentage of the starting dispersion of studied phenomenon (75,44%). Table 1 and Figure 1 present relative shares of the explained by each factor output dispersion of studied phenomenon – physical development and specific sport performance of 15-16-year-old cyclists.

When identifying and ranking the factors we taken into account the following parameters and criteria:

- the percentage of explained by any factor output dispersion of studied phenomenon ( $\Sigma a^2$ );
- the level of expression of factor in the overall factors structure, which reveals information about values of  $h^2$ ;
- the factor weight of each index in a given factor and its direction (sign) that reveal the strength and character of relationship (positive or negative) between indexes within the individual factor.

Analysis of the above presented Table 1 and Figure 1 show that the basic factor explains the extremely high percentage (37,66%) of start dispersion of studied phenomenon. The next three factors have lower contribution to the overall physical development and specific performance of boys in the studied age group (respectively 15,43%,

Table 1: Physical development and specific sport performance factor structure of cyclists (15-16-year-old)

№	indexes \ factors	I	II	III	IV	h2	1-h <sup>2</sup>
1.	30 m - crouch start	0,645	-0,408	0,141	-0,119	0,617	0,383
2.	30 m - standing start	0,653	-0,238	-0,006	-0,04	0,485	0,515
3.	100 m	0,851	0,095	-0,305	-0,181	0,859	0,141
4.	200 m	0,878	0,008	-0,115	-0,241	0,842	0,158
5.	500 m	0,88	0,037	-0,289	-0,217	0,906	0,094
6.	1000 m	0,874	-0,222	-0,074	-0,183	0,853	0,147
7.	2000 m	-0,109	0,034	0,048	0,419	0,191	0,809
8.	Hand dynamometry - strong upper limb	0,031	0,823	0,248	-0,013	0,74	0,26
9.	Hand dynamometry - weak upper limb	-0,525	0,688	0,071	0,098	0,763	0,237
10.	Forward body incline	-0,102	0,822	0,015	0,141	0,707	0,293
11.	Standing long jump	-0,771	0,08	-0,043	0,21	0,647	0,353
12.	Vertical jump	-0,797	0,222	0,316	-0,063	0,788	0,212
13.	Height	-0,255	0,16	-0,338	0,883	0,984	0,016
14.	Weight	-0,397	0,32	0,73	0,37	0,93	0,07
15.	BMI	-0,143	0,136	0,911	-0,365	0,999	0,001
	Σα2 (%)	37,66%	15,43%	12,42%	9,93%		75,44%

12,42% and 9,9%).

The first factor in the age 15-16-year-old cyclists (Figure 2) explains the high percentage of starting dispersion for respondents (37,66%).

The second factor (15,43%) determines the place of grip strength and body flexibility in the factor structure of physical development and specific workability of 15-16-year-old cyclists (Figure 3).

The third factor (Figure 3), the morphological factor explaining 12,42% of the initial dispersion. It can be identified as “Body Mass Index”. It reveals the advantage given to boys of that age group more massive body structure.

The fourth factor (Figure 3) explains the lowest percentage of initial dispersion (9,93%). It determines the importance of cyclists’ height as a factor from which depends the specific performance.

The factor analysis results can be applied as criterion for optimization of educational and training process during future training sessions with young Bulgaria cyclists.

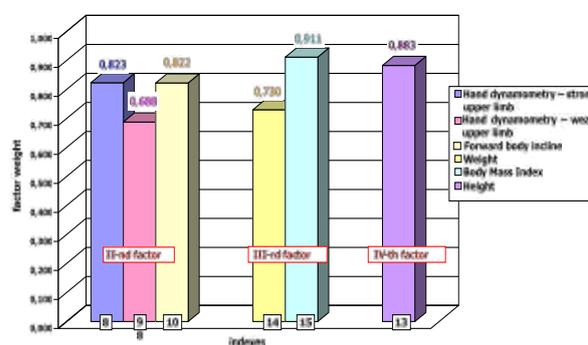


Figure 3. Factor structure of physical development and specific workability of 15-16-year-old cyclists: 2nd, 3rd and 4th factors.

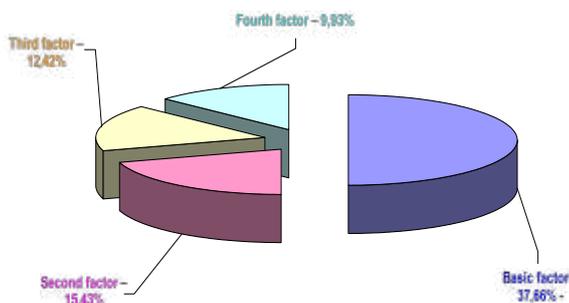


Figure 1. Relative shares of explained by every factor output dispersion for 15-16-year-old cyclists.

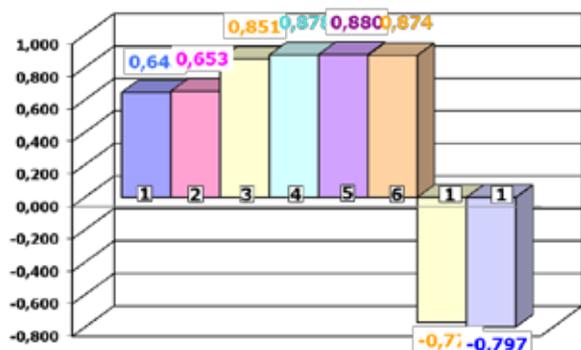


Figure 2. Factor structure of physical development and specific workability of 15-16-year-old cyclists – 1st factor.

CONCLUSIONS

With high level of significance are so called morphological factors that reveal the importance of human body growth and body mass structure development for development in cycling sport.

The displayed factors determine the features which should be mainly developed during studied period. Efforts for raising the level of other studied signs will not have the same training effect and will not lead to significant increase in the level of specific sport performance of young cyclists.

Specific sport performance is a determining component of factor structure in the 15-16-year-old cyclists. It is known that the process of multi-annual training process in all sports are subject to rigorous methodological logic.

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