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CORRELATION-STRUCTURAL MODEL OF THE INDICATORS OF SPECIFIC PHYSICAL PREPARATION AND BASIC MOTOR SKILLS IN 9-10-YEAR-OLD STUDENTS AFTER INITIAL TRAINING IN MINI-VOLLEYBALL

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ABSTRACT

The need to create a correlation-structural model of the indicators of specific physical preparation and basic motor skills in 9-10-year-old students playing mini-volleyball is dictated by the dynamics of volleyball development and the need to lower the age limit at the beginning of training.

Purpose of the study is to develop a correlation-structural model of the indicators of specific physical preparation and basic motor skills in 9-10-year-old students after initial training in mini-volleyball.

METHODS: The study included 90 students aged 9-10 years who began initial training in mini-volleyball. The indicators of specific physical preparation and basic motor skills were studied.

RESULTS: After the impact, an increase in the level of dependence between the indicators of general physical preparation and the specific basic motor skills was observed.

CONCLUSIONS: At the age studied, i.e. 9-10 years, the anthropometric indicators did not affect the mastery of basic motor skills, as there were no moderate or strong dependences. The most technically difficult element for the subjects of the study, i.e. two-foot jump after a volleyball run-up, did not correlate with the tests for development of physical qualities, which means that this is a matter of technical preparation and not so much physical.

Key words: volleyball, initial training, specific physical preparation, basic motor skills, correlation matrix.

INTRODUCTION

Along with solving common tasks and improving vital motor habits, training in mini-volleyball at school contributes to the early detection of the so-called "volleyball" talents as early as at school age, and is also a prerequisite for mass inclusion of students of different ages in regular sports activities not only at school, but throughout their lives.

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The possibilities to master one or another kind of sport are detected in the initial forms of sports activity, i.e. in school physical education. It is for this reason that we focused mainly on the initial stage of the long creative process and discovery of basic motor skills and coordination abilities, which are a prerequisite for mastering volleyball skills in the very initial stage of lower secondary education.

On the detection of fundamental qualities that are necessary for sports games, the following scientists have worked: Aleksieva, M., S. Denev (1), Belomazheva-Dimitrova, S., Angelova, P (2), Dyakova, G., Angelova, P., Angelova, Iv., Dyakov, T., Belomazheva-Dimitrova, S (3). In a

number of own publications and research, as well as in scientific-theoretical analyses, the problems of volleyball training and game improvement were studied.

The need to include mini-volleyball in primary education is dictated by the dynamics of the development of volleyball and the need to lower the age limit at the beginning of training. Research in the field of early volleyball training has been conducted by Bozhkova, A (4). The opportunities provided by the International Volleyball Federation for the development of mini-volleyball and the creation of a programme for its development worldwide provoked us to conduct initial training with students in the initial stage of lower secondary education. The age of 6 to 9 years is particularly sensitive to the development of speed and explosive power. The means of mini-volleyball used by us aimed to develop speed and strength and general physical preparation, while laying the foundations of motor preparation for volleyball by accumulation of basic motor experience, which turns out to be the most adequate for the specifics of the age.

Mini-volleyball provides opportunities for the accumulation of basic motor skills and habits typical of volleyball at this age, which, in our opinion, provides a basis for the formation of specific skills in the next stage of training.

The goals set for the subjects studied were: maximum increase in the number of touches of the ball by one player during the performance of exercises for improvement of the technique; maximum diversification of the trajectory of the ball reaching each player before performing a technique. Every touch of the ball had to be preceded by movement around the court; the activities during the game had to be realistic and meet the level of technical preparation so that the children were not disappointed with the handling of the ball (first, the children had to learn to catch the ball and throw, and then perform a volleyball pass); during the game, the players were given a greater chance to control the ball, and it was possible to catch it with one of the three touches permitted by the rules before the ball crossed the net. The passive position of the players was avoided to a minimum; technical elements were included, which were adapted to the age group of the players. The adapted technique created satisfaction in the children with the elements performed during the game.

The modern organization of educational system and the introduction of new curricula in physical education and sports require the approbation in practice of qualitatively new and effective methods for learning the content. On the introduction of improved methods, the following scientists have worked: Gigov, D (5), Dimitrov, M (6), Krumova, (7), Kyuchukov B(8),. Improving the complex reactions when playing in attack in volleyball, VFK, 1987. Attention should be paid to the development of habits in young volleyball players for quality warm-up before and relaxation after exercise, in order to prevent sports injuries in older age.

Hence, the need to study the impact on the level of physical preparation and mastery of the basic components of the game by the players.

The purpose of the study is to develop a correlation-structural model of the indicators of specific physical preparation and basic motor skills in 9-10-year-old students after initial training in mini-volleyball.

METHODS

Subjects of the study were 90 students aged 9-10, who began initial training in volleyball. The impact was exerted for a period of 12 months.

The indicators studied can be seen in **Table 1.**

RESULTS

In the study, a simple linear Pearson correlation with a correlation coefficient (r) was used. The whole set of detected dependences between the studied groups, both at the beginning and end of the pedagogical experiment conducted, were presented in special correlation matrices, and the correlation models - in figures (1-4). The large number of correlations complicated their analysis and reasoning, which required that only those with a correlation coefficient higher than 0.360 be included in the correlation-structural models.

Only significant coefficients are subject to comment; according to the scientific requirements, moderate correlation exists in significance level r = 0.3 - 0.5, significant correlation in r = 0.5 - 0.7, and large correlation in r = 0.7- 0.9 **(Table 2).**

Table 1. *Assessment Indicators*

№	*Indicators*	*Units*	*Accuracy*	*Direction*
Anthropometric Indicators				
1.	*Height*	*cm*	*0.1*	+
2.	*Body weight*	*kg*	*0.1*	+/-
3.	*Vertical stretch*	*cm*	*0.1*	+
4.	*Height of two-foot standing jump*	*cm*	*0.1*	+
General Physical Preparation Assessment Indicators				
5.	*Height of two-foot standing jump*	*cm*	*0.1*	+
6.	*Two-foot standing long jump*	*cm*	*0.1*	+
7.	*Depth of inclination*	*cm*	*0.1*	+
8.	*10-meter sprint from high volleyball starting stance*	*s*	*0.1*	-
9.	*Two-hand overhead standing throwing of 1-kg solid ball across the net*	*m*	*0.1*	+
10.	*Two-hand overhead sitting distance throwing of 1-kg solid ball across the net*	*m*	*0.1*	+
Speed and Power Assessment Indicators				
11.	*Height of one-foot one-step run-up jump*	*cm*	*0.1*	+
12.	*Height of one-foot three-step run-up jump*	*cm*	*0.1*	+
13.	*Height of two-foot three-step run-up jump*	*cm*	*0.1*	+
14.	*Two-hand overhead throwing of 1-kg solid ball across the net after a two-foot one-step run-up jump*	*m*	*0.1*	+
Special Physical Preparation Assessment Indicators				
15.	*9-3-6-3-9 m shuttle running*	*s*	*0.1*	-
16.	*Drilling and jumping over*	*s*	*0.1*	-
17.	*Figure 8 drill*	*s*	*0.1*	-
Special Physical Preparation Assessment Indicators - Accuracy				
18.	*Two-hand overhead volleyball throwing (imitation of a volleyball pass) at a vertical target*	*points*	*1*	+
19.	*Volleyball throwing at a horizontal target across the net (imitation of a volleyball pass)*	*points*	*1*	+
20.	*Volleyball pass at a target (basketball hoop)*	*points*	*1*	+

Table 2. *Coefficient of correlation of indicators*

Correlation	***Coefficient***	***Colour***
Weak	*Below 0.3*	----------
Moderate	*0.3-0.5*	----------
Significant	*0.5-0.7*	----------
Large	*0.7-0.9*	----------
Extremely large	*Over 0.9*	

Note: The critical value of the Pearson simple linear correlation coefficient (r) is 0.36, where (k = n-2) is 28, with significance level (α = 0.05)

It was repeatedly proven that the complex development of motor skills in the initial stage of lower secondary education is extremely important in laying the foundations of sports specialization at a later stage and, in general, for the overall physical development of the child's body.

For this reason, we study the correlation-structural models of physical preparation of the experimental group before and after the impact of the experiment.

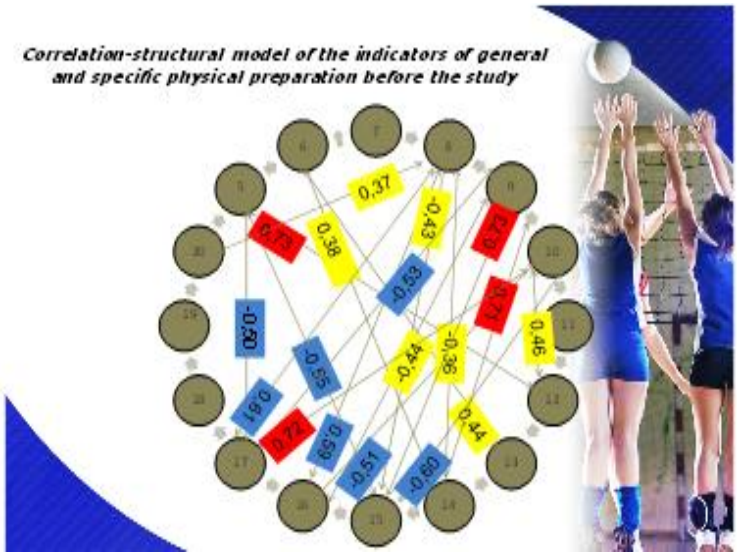


Figure 1. Correlation-structural model of the indicators of general and specific physical preparation before the study

Legend: 5 - Height of two-foot standing jump; 6 - Two-foot standing long jump; 7 - Flexibility; 8 - 10-meter sprint from high volleyball starting stance; 9 - Two-hand overhead standing throwing of 1-kg solid ball across the net; 10 - Two-hand overhead sitting distance throwing of 1-kg solid ball across the net; 11 - Height of one-foot one-step run-up jump; 12 - Height of one-foot three-step run-up jump; 13 - Height of two-foot three-step run-up jump; 14 - Two-hand overhead throwing of 1-kg solid ball across the net after a two-foot one-step run-up jump; 15 - 9-3-6-3-9 m shuttle running; 16 - Drilling and jumping over; 17 - Figure 8 drill; 18 - Two-hand overhead volleyball throwing (imitation of a volleyball pass) at a vertical target; 19 - Volleyball throwing at a horizontal target across the net (imitation of a volleyball pass); 20 - Volleyball pass at a target (basketball hoop).

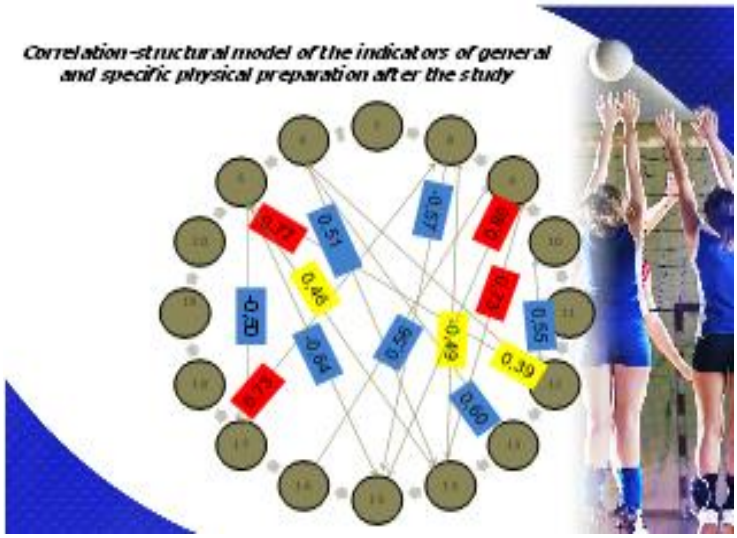


Figure 2. Correlation-structural model of the indicators of general and specific physical preparation after the study

Note: The critical value of the Pearson simple linear correlation coefficient (r): (k = n-2) is 28, with significance level (α = 0.05) 0.36

The analysis of the correlation models (**Figure 1 and 2**) shows that there were 17 statistically significant dependences between the studied indicators of general physical preparation - *5, 6, 7, 8, 9 and 10* and special physical preparation and basic motor skills - *tests 12, 13, 14, 15, 16, 17, 18, 19 and 20* at the beginning of the period studied **(Figure 1)**.

The analysis of the correlation matrices shows that there were 18 statistically significant dependences between the studied indicators of general physical preparation - 5, 6, 7, 8, 9 and 10 correlating with the indicators of special physical preparation and basic motor skills - 12, 13, 14, 15, 16, 17, 18, 19 and 20 at the end of the period studied **(Figure 2)**.

There was a significant improvement in the correlation of the indicators of general and specific physical preparation between tests 6 and 14, where the correlation coefficient increased from r = 0.38 to r = 0.51. This was the correlation of long jumps and solid ball throwing where the explosive power of the lower and upper limbs was manifested.

The analysis of the correlation after the impact shows an increase in the level of dependence between the indicators of general physical preparation and the specific basic motor skills **(Figure 2).** Relatively large correlation was observed between tests 5 and 12, where r = 0.77, between 6 and 12 with r = 0.77, and between 9 and 14 with r = 0.73. At the same time, we noted that some weak dependences were eliminated (values below 0.36 are not taken into account). At the end of the experiment, there was a medium and strong dependence between a number of indicators. With the highest number of dependences – 7 - at the end of the study was indicator 8, and indicators 5, 9, 12, 14, 17 had 6 correlations each. A high degree of dependence was observed between the indicators of explosive power of lower and upper limbs 5 and 12, where r = 0.77, and between indicators 8 and 17, where r = 0.73. The indicators of speed - indicator 8 - and ability to move in space - indicator 15 were also in moderate dependence, with the correlation coefficient at the end of the experiment being r = 0.57.

At the end of the experiment, the same moderate correlations between indicators 5 and 17 r1 = -0.50 and r2 = -0.50, as well as between indicators 9 and 14 (r1) = 0.71 and r2 = 0. 73 remained.

There was also a loss of moderate correlations between indicators 8 and 16 as well as between indicators 9 and 17, 10 and 15, 16 and 17. On the other hand, the correlations of other indicators such as 9 and 5 increased, where the difference was 0.27 units (from 0.50 to 0.67). At the beginning of the study, with the highest number of indicators correlated tests 8 “10-meter sprint from high volleyball starting stance” and 17 “Figure 8 drill”. There were 8 dependences **(Figure 3 and Figure 4).**

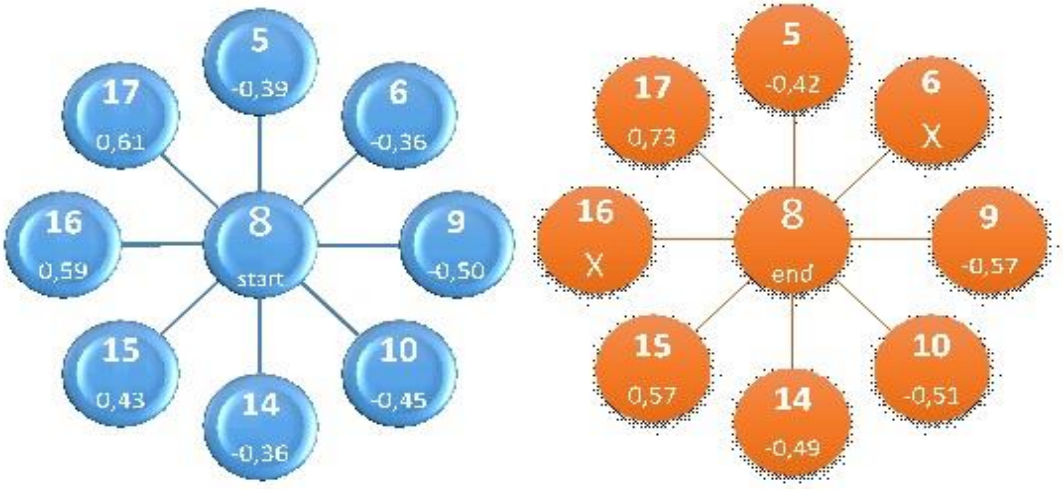


Figure 3. Correlation-structural model of indicator 8 (10-meter sprint) at the beginning and end of the experiment
Legend: 5 - Height of two-foot standing jump; 6 Two-foot standing long jump; 8 - 10-meter sprint from high volleyball starting stance; 9 - Two-hand overhead standing throwing of 1-kg solid ball across the net; 10 - Two-hand overhead sitting distance throwing of 1-kg solid ball across the net; 14 - Two-hand overhead throwing of 1-kg solid ball across the net after a two-foot one-step run-up jump; 15 – 9-3-6-3-9 m shuttle running; 16 - Drilling and jumping over, 17 - Figure 8 drill;

At the end of the experiment, the same indicator moderately correlated with fewer signs, but higher values of the correlation coefficient. The values of the correlation coefficient (r) at the end of the experiment were increased by 0.03 for *test 5*, 0.07 for *test 9*, 0.06 for *test 10*, 0.13 for *test 14*, 0.14 for *test 15*, and 0.12 for *test 17*. At the same time, in the second study the correlations *with indicator 6 "Two-foot standing long jump" and indicator 16" Drilling and jumping over"* were lost **(Figure 3).**

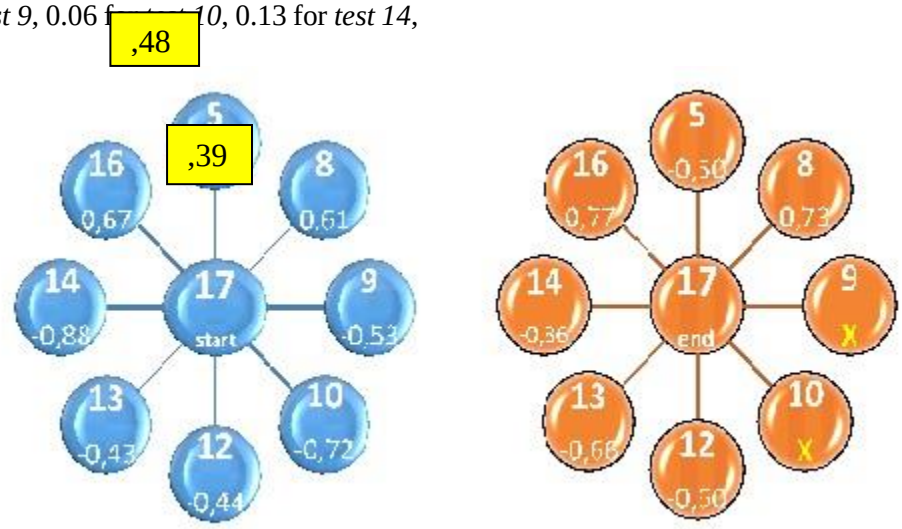


Figure 4. Correlation-structural model of indicator 17 (Figure 8 drill) at the beginning and end of the experiment

The highest correlation coefficient at the beginning of the study was between *indicator 9 "Two-hand overhead standing throwing of 1-kg solid ball across the net" and indicator 10 "Two-hand overhead sitting distance throwing of 1-kg solid ball across the net", with r = 0.70; here, the dependence was significant and direct* **(Figure 5).**

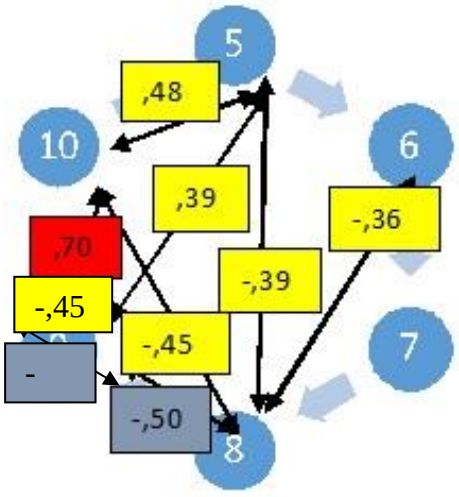


Figure 5. Correlation-structural model of the indicators of general physical preparation at the beginning of the experiment

The indicators of the level of general physical preparation correlated with each other. In tests 5, 6, 7, 8, 9, 10 at the beginning of the study, 7 moderate and strong dependences were noticed **(Figure 5).** In the modern conditions of the sports-training process and especially in the planning and modelling of sports training, importance is given to the correlations of the indicators of general physical preparation and specific motor preparation of mini-volleyball players.

For example, between the physical quality of jumping measured with test 5 "Height of two-foot standing jump" and the speed-power capabilities measured with test 10 "Two-hand overhead standing throwing of 1-kg solid ball across the net" it was found that in the first study the dependence was moderate r = 0.39, and in the second study the dependence was significant r = 0.66.

This result confirmed that when working on the explosive power of lower limbs, the speed-power capabilities are also strongly developed.

Along with mastering the technical elements, the necessary specific physical qualities for the game of mini-volleyball were developed, which was a proof of effective educational and training activity.

The development of the general and specific physical preparation and the mastery of the basic elements of technique are in unity. At this age, it is necessary to carry out a complex development of physical qualities together with mastering the basic technical skills of the game.

The correlations between the indicators for assessment of special physical preparation and the level of mastery of basic motor skills are presented in **Figure 6**.

The analysis of the correlation-structural model of the indicators of special physical preparation and basic motor skills in both studies shows that at the beginning of the experiment there were 7 statistically significant dependences between the indicators of special physical preparation and mastery of basic motor skills, 4 of which moderate, one significant, and two large **(Figure 6)**. After the end of the experiment, an increase in the correlations was observed in some of the indicators. The increase proved that the work was focused on these qualities. In the first study, the percentage of correlations was 39.02%, and in the second it was 26.82%. At the same time, the correlations became more stable and concentrated, and their values increased in the second study. There was a strong dependence between tests 5 and 12 (height of two-foot standing jump and height of one-foot three-step run-up jump), which was natural reflection of the work on the explosive power of lower limbs r = 0.73. In tests 9 and 15 (solid ball throwing and shuttle running), there was also a large correlation: r = 0.73). This was a confirmation of the comprehensive work to develop the strength of the lower limbs, trunk, and upper limbs.

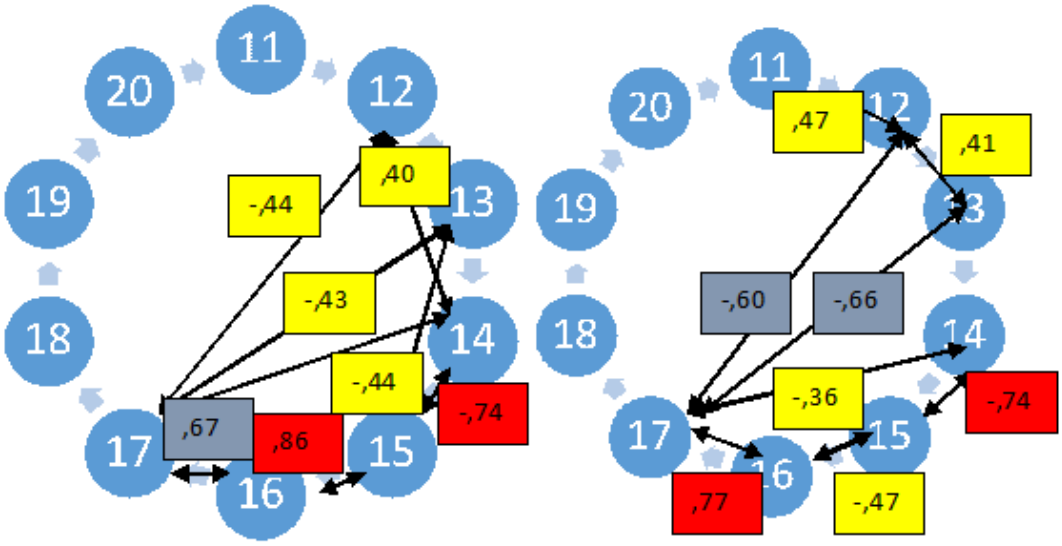
CONCLUSION

The correlation analysis of the indicators gives grounds to draw the following conclusions:

At the end of the experiment, a larger number of statistically significant correlations between the indicators studied were registered, which was a confirmation of the successful impact of the means of mini-volleyball. Significant correlations were observed (with r = 0.5 to 0.7) between the general physical preparation and basic motor skills at the end of the impact. High correlations were also found between the indicators of development of specific physical qualities and those of mastering basic motor skills.

At the age studied, i.e. 9-10 years, the anthropometric indicators did not affect the mastery of basic motor skills, as there were no moderate or strong dependences. The "10-m sprint" test correlated with the most number of indicators (8) at the end of the study, which was helped by the sensitive period of speed development at this age.

The most technically difficult element for the subjects of the study, i.e. two-foot jump after a volleyball run-up, did not correlate with the tests for development of physical qualities, which, in our opinion, means that this is a matter of technical preparation and not so much physical.



First study *Second study*

Figure 6. Correlation-structural model of the indicators of special physical preparation and basic motor skills in both studies

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