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Volleyball players' somatic composition in the Final Six of 2019 FIVB Volleyball Nations League

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Abstract

Introduction. International volleyball games are very popular. One of the youngest events in this discipline is the Volleyball Nations League, created by FIVB. It is important for trainers and researchers in which direction the best teams in the world are developing. Monitoring morpho-functional changes allows you to track potential trends in volleyball.

Purpose. The aim of the study was to analyze sports results and the somatic composition of the best six teams participating in the 2019 FIVB Volleyball Nations League in Chicago.

Material and methods. Research material involved volleyball players participating in the FIVB Volleyball Nations League (n = 73). Their age, height, weight, spike reach, block reach, and Rohrer's index were analyzed. The mean value of the features and their derivatives in

individual teams and groups were calculated and verified using statistical tests (t-Student, Kolmogorov-Smirnov's) if the differences were significant.

Results. The subjects' mean age was 26,73 years (SD = 3,73), mean body height was 200,25 cm (SD = 5,94), mean body weight was 89,70 kg (SD = 8,05), mean spike reach was 346,47 cm (SD = 10,87), mean block reach was 326,14 cm (SD = 12,66), mean Rohrer's index was 1,12 (SD = 0,10). 94,52% of the volleyball players manifested the leptosomatic body composition, 5,48% the athletic one. The best team and the teams ranked 2-6 places in the analyzed tournament significantly differed in the block reach ($P < 0,05$).

Conclusions. During the Final Six 2019 FIVB Volleyball Nations League in Chicago, the leptosomatic type of body was dominated by volleyballers at the highest level. The block reach significantly differentiate the winner of tournament and the others teams. These characteristics should be taken by trainers into account in team building to play men's volleyball.

Key words: Volleyball, sports result, anthropometry, body type

Introduction

Volleyball at the highest level of the game, in addition to high standards of team cooperation, also requires extremely well-developed individual skills in the field of technique, tactics, motor skills, as well as somatic predispositions. The evolution of volleyball concerns changes in the rules of the game, the training system or prevention and rehabilitation of players. Changing regulations and requirements also cause changes in some morphological criteria for this discipline [1].

Many authors give anthropometric characteristics of people practicing volleyball in various countries [2,3,4,5,6].

In addition to the most prestigious events such as the Olympic Games and World Championships, FIVB has been organizing the Volleyball Nations League (formerly the World League) since 2018. The 2019 FIVB Volleyball Nations League include the best 16 teams, which compete in a Preliminary Round over five weeks in a total of 20 pools of four teams each. There is one ranking table across all pools with the top five teams at the end of the Preliminary Round joining the hosts for the Finals. Teams in the Finals are placed in two pools of three teams each, with the top two of each pool advancing to semifinals followed by the medals matches. FIVB Volleyball Nations League is an opportunity for coaches to check the possibilities of fighting the best and most important competitions representing the preceding Olympic Games tournament in Tokyo 2020 [7].

It turns out that due to the represented level of gameplay there are some differences in the aspect of somatic features and the level of motor skills among volleyballers. Many authors state that the level of players varies age, somatic composition, physical fitness trials and technical and tactical skills [8,9,10]

The aim of this study was to analyze athletic performance and somatic composition of the best six teams participants in the 2019 FIVB Volleyball Nations League in Chicago. In study compared specific of the Russian team – the winner of the tournament – was assessed in comparison to all teams. Research allowed to answer the following questions :

1. What is the average level of somatic structure and the level of motor efficiency of the participating teams in the Finals of 2019 FIVB Volleyball Nations League?
2. What is the body types of the examined volleyball players the best six teams in the FIVB Volleyball Nations League 2019?
3. Do the somatic composition characteristics and the level of motor efficiency significantly differentiate Russian team and teams from places 2-6 in tournament?

Material and method

The research sample involved players of 6 teams participating in the Final Six of FIVB Volleyball Nations League 2019 held in Chicago from 10 to 14 July 2019. The total number of the examined volleyball players was 73. Players from the libero position were excluded from the analysis due to their different tasks on the pitch. The research group was made of all participants in the Final Six of FIVB Volleyball Nations League 2019. It include six top classified teams: 1. Russia, 2. USA, 3. Poland, 4. Brazil, 5. Iran, 6. France. Data on age, body height, body weight, one-arm spike reach and both-arm block reach were obtained from the official website of the FIVB Volleyball Nations League 2019 [7].

One-arm spike reach and both-arm block reach were examined using a measuring tape to test the reach. To test one-arm spike reach, having taken a run-up a subject jumped from both feet, as in attack, to mark the maximum reached height with fingers of one hand on the measure. Both-arm block reach was tested with a trial in which the subject jumped from the spot with both feet, as in block, and marked with fingers of both hands the point reached on the measure. Rohrer's slenderness index was calculated taking into account the data on body height and weight.

Types of body composition were defined by means of Curtius's key with a use of Rohrer's index, according to Kretschmer's typology: $x-1,27$ the leptosomatic type, $1,28-1,49$ the athletic type and $1,50-x$ the pyknic type [11]. The leptosomatic type is characterized by slender and elongated body composition, low body weight, and the length dimensions predominate over the width ones. The athletic type is distinguished by a strong skeletal structure and the muscle system, and the length and width dimensions are proportionate. The pyknic type is characterized by short limbs and a predominance of width dimensions over the length ones.

Mean values of the features and their derivatives in particular teams and groups were statistically analyzed. The distributions of the analyzed variables were examined with the Kolmogorov-Smirnov's test and no significant deviations from the normal distribution were found. In order to verify the statistical significance of differences in particular groups, statistical tests were used. Student's t test was used to compare the intergroup diversity. The obtained results were developed with a use of statistical software STATISTICA 10.

Results

Analysed features of the surveyed top volleyball players from 6 the best teams, participating in the FIVB Volleyball Nations League 2019 are shown in Table 1.

Table 1. Numeric characteristics of the examined features and Rohrer's index of the best teams participants in the FIVB Volleyball Nations League 2019

Subjects	Total (n=73)		Russia (n=12)		USA (n=13)		Poland (n=12)		Brazil (n=12)		Iran (n=12)	
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD
Age	26,73	3,73	25,67	2,77	27,62	4,09	24,92	3,00	29,08	4,10	26,67	4,36
Body height (cm)	200,25	5,94	201,75	5,94	201,15	6,24	201,42	4,94	199,33	6,88	200,00	5,48
Body weight (kg)	89,70	8,05	90,25	6,45	89,00	6,10	91,50	8,54	92,08	11,17	86,83	8,61
Spike reach (cm)	346,47	10,87	348,58	8,80	350,69	10,38	347,58	9,43	341,58	13,22	343,25	11,10
Block reach (cm)	326,14	12,66	334,92	9,93	332,46	12,27	322,08	8,97	319,42	13,20	324,58	13,13
Rohrer's index	1,12	0,10	1,10	0,08	1,10	0,08	1,12	0,11	1,16	0,11	1,09	0,11

\bar{x} – mean, SD – standard deviation

The mean age was 26,73 years old (SD = 3,73), body height – 200,25 cm (SD = 5,94), body weight – 89,70 kg (SD = 8,05), spike reach 346,47 cm (SD = 10,87), block reach – 326,14 cm (SD = 12,66), Rohrer’s index – 1,12 (SD = 0,10). The youngest team was Poland 24,92 years old (SD=3,00), the oldest Brazil 29,08 years old (SD=4,10). The tallest team was Russia – 201,75 cm (SD=5,94) in the other hand the lowest team was France – 197,75 cm (SD=6,24). The heaviest team was Brazil – 92,08 kg (SD=11,17), the lightest was Iran 86,83 kg (SD=8,61). The highest spike reach achieve team USA 350,69 cm (SD=10,38). While the highest block reach belong to Russian team 334,92 cm (SD=9,93). The lowest spike reach and block reach belong to team Brazil respectively 341,58 cm (SD=13,22) and 319,42 cm (SD=13,20) in block. Supreme result in Rohrer’s index had Brazil team 1,16 (SD=0,11), the lowermost had Iran 1,09 (SD=0,11) (Table 1).

Table 2. Body types of the examined volleyball players the best six teams and team which won the FIVB Volleyball Nations League 2019

Subjects	Total (n = 73)		Russia (n = 12)	
	n	%	n	%
Leptosomatic	69	94,52	12	100,00
Athletic	4	5,48	0	0
Pyknic	0	0	0	0

n – number of subjects, % – percentage value

94,52 % of the volleyball players participating in the tournament had leptosomatic body composition, 5,48 % were athletic (Table 2). The winner of the tournament, the Russian team, compared to all the participating teams, manifested a higher mean body – d = 0,55 kg, taller body – d = 1,5 cm, spike reach – d = 2,11 cm and block reach - 8,78 cm. By contrast, they had lower mean age of the players – d = 1,06 years, and lower Rohrer’s index – d = 0.02 (Table 1). 100,00% representatives of the Russian national team exhibited the leptosomatic body type. There were no players with the pyknic type of composition in either of the groups (Table 2).

The teams from place 2-6 and Russian team significantly differed from each other in block reach (P < 0.00) (Table 3).

Table 3. A comparison of the features of somatic composition and Rohrer’s index in players from places 2-6 and Russia team in the FIVB Volleyball Nations League 2019

Subjects	Teams from places 2-6 (n=61)		Russia (n=12)		d
	\bar{x}	SD	\bar{x}	SD	
Age	26,93	3,87	25,67	2,77	0,19
Body height (cm)	199,95	5,95	201,75	5,94	0,35
Body weight (kg)	89,59	8,37	90,25	6,45	0,76
Spike reach (cm)	346,05	11,25	348,58	8,80	0,40
Block reach (cm)	324,41	12,48	334,92	9,93	0,00*
Rohrer’s index	1,12	0,10	1,10	0,08	0,46

\bar{x} – mean, SD – standard deviation, d – differences between means

Statistically significant differences for *p ≤ 0,05

Discussion

The possibility of playing sports professionally is often associated with having appropriate predispositions. Highly qualified sport is predisposed for people with special somatic features suitable for a given sport. According to many publications, body builder qualities such as height and weight are extremely important for achieving very high volleyball sports results [1,12,13].

Already at the level of selection of the most talented youth, body height plays a significant role and volleyballers are characterized by far more developed length features than the average for a given population [14]. In studies of selected teenage volleyballers, their average body height was 189.3 cm [15]. Youth volleyballers from Brazil also achieved high results of this feature [16]. The average body height of the volleyballers in Polish I League in the 1960s was 181.5 cm [17]. However, at the Olympic Games in Seoul in 1988, the US team champions achieved an average body height of 193.9 cm. In turn, the gold medalists from Sydney - representatives of Yugoslavia were characterized by an average height of this feature of 196.8 cm [18]. In 2014, the gold medalists of trainer Stephan Antiga reached 200.08 cm in average body height and compared to these tests, the result is lower by 1.67 cm [9].

It should be remembered that in this discipline there are also differences in the body structure of players due to their position on the field [19,20]. This is justified by their role during the game. Competitors with lower body height and lower limb length are more effective in defensive action. However, very well developed body length features allow for more effective play over the net, both in the block and in the attack.

The presented research shows that over the years the average body height of volleyballers has increased significantly. It is possible that this is associated with a change in the specifics of the game, which has become more dynamic, and global trends have forced specific characteristics of the best volleyballers.

It is very important to determine the age at which sports successes are gained. Analyzing the average age of Olympic winners from Sydney (2000) to Beijing (2008), it was found that there was an upward trend in this aspect. Winners of subsequent tournaments were characterized by an average age of 26.9 years - Yugoslavia (Sydney, 2000), 29 years Brazil (Athens, 2004) and 30.5 USA (Beijing, 2008) [21]. The Polish championship team in 2014 had an average age of 27.58 years [9]. Interestingly, in the case of these studies, the average age of Russian representatives was 25.67, and according to the analysis, it was one of the younger teams at The Final Six FIVB Volleyball Nations League in Chicago.

Undoubtedly, jumping is one of the most important ways of moving during a volleyball match. Thanks to it, players can effectively perform both offensive and defensive tasks on the pitch. The average range in the spike reach of teams participating in the Chicago tournament was 346.47 cm, while in the block reach 326.14 cm. Similar results were obtained at the Sydney Olympics, the average of these parameters among the top 8 teams was 345.6 cm in spike reach and 326.3 cm in block reach respectively [18]. Wnorowski and Ciemiński [9] analyzing the 4 best teams at the World Championships in 2014 found an average range in the block reach of these teams of 323.57 cm. This is lower by 2.57 cm than for these tests. It should be noted, however, that this result was due to the very high result obtained by the tournament winners - the Russian team 334.92 cm. In the case of such a high result, it is possible that this feature contributed to the effective play of the Russian team in the block.

In volleyball, somatic structure is important. For typological determinations, the Kretschmer system was used, taking into account three body types - leptosomatic, athletic and picnic. In the studies of Jaszczanin at all [22] it was found that 81.89% of Polish league volleyballers in the 2000/2001 season had a leptosomatic body type, 17.32% were athletic

body type 0.79% were picnic. During the Final Six the leptosomatic composition type was dominant among volleyball players (94.52%) in comparison with the athletic (5.48%).

Teams competing in Final Six 2019 FIVB Volleyball Nations League in Chicago do not differ significantly in terms of age, body height, weight, spike reach, Rohrer's index from the tournament winner. The only significant difference between the teams was the range in the block reach. It is possible that this feature played a significant role in the final classification. On the other hand, it should be borne in mind that other factors may determine the final result in this type of competition. Therefore, it should be borne in mind that changes resulting from the rules of the game, tactical modifications and the division of roles and tasks on the pitch during the game makes the volleyball constantly change. Therefore, the presented study is still valid and necessary.

Conclusions

The results of the presented tests of volleyballers appearing in Final Six 2019 FIVB Volleyball Nations League in Chicago provide the necessary information for analysis by coaches. The results achieved by the presented teams, together with the characteristics of the body structure and motor skills of volleyballers, determines the direction of development of volleyball at the highest level.

According to research conducted in international competitions, leptosomatic body type dominates among players, which is also confirmed by other publications. Winners of the 2019 FIVB Volleyball Nations League, Russian representatives have achieved significant differences in block reach relative to other competing teams. All players from the Russian national team were characterized by the leptosomatic body composition type.

The results of the work received should be analyzed by trainers in the preparation of training cycles and team building.

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