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Comparative analysis of changes in body composition of young volleyball players during the season

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Abstract

Introduction. The possibility of achieving the highest successes in sport competition is associated with the constant selection from the youngest years of volleyball. Volleyball skills and somatic predispositions are an important factor influencing the selection of juvenile athletes to the representation of the region and national representations.

Material and methods. Diagnosis and monitoring of the development of talented athletes enables the selection of the most talented individuals and information for trainers to individualize the development of their proteges. The aim of this work is to compare the changing somatic features during the season in teenage volleyball players. 47 men aged 14-15, who played on the same level of competition, were qualified for the study. The tests were

carried out twice before the start league and at the end of the season. The measurement data of 16 somatic features were used.

Results and summary. The presented results prove significant changes in individual somatic features during the season. Impact of personal development and training loads, there have been significant changes in the development of the skeleton and muscularity of volleyball players.

Keywords: Body, volleyball, selection

Introduction

The sports success in the form of medals consists of many factors. Trainers striving to achieve the greatest laurels often look for various solutions to improve the skills of their students, using the latest research on effective measures and methods of training to achieve athletic championships at different periods of ontogenesis (Płatonow and Sozański, 1991). Thanks to the conducted research in the biomechanical, morphological, physiological, biochemical, etc. aspects, it is possible to identify and select predisposing units to achieve the highest results in sport competition (Ulatowski, 1996). Numerous scientific publications prove that somatic predisposition is an important classification factor for practicing sports at a high level.

In team sports, reaching high places is an extremely complex art and requires knowledge in many fields. Therefore, an extremely important aspect is the appropriate selection of the most talented players from the youngest years of practicing a specific sport discipline. Appropriate selection and criteria of tests give a high probability that the selection of units that meet the requirements of modern volleyball will be effective (Świderek et al., 2012). The main principle of qualified sport is the characteristic selection of players by searching for individuals who may be predisposed to play at the highest champions level (Naglak, 2003).

It seems that the path to success in team sports games is the ability to plan and manage an individualized training process, in terms of diversifying the somatic, motor ability, psychological and special skills of the player (Czerwiński, 2003). The process of training

individualization plays an important role in the proper development of the players' body structure, which is not always emphasized and implemented in club practice.

The aim of the work is to compare the changing somatic features during the season, in teenage volleyball players training in clubs in Lower Silesia.

Materials and methods

Two tests of the same group of volleyball players were carried out in two parts. The first was carried out before the start season in 2017. The second study was conducted at the end of the start-up phase in 2018. The time between studies was 6 months. Volleyball players representing the same level of sport preparation and starting in the Polish Volleyball Federation in the "youngster" category. 47 men aged 14-15, playing in 4 clubs in Lower Silesia were qualified for the study.

The measurement data of 16 somatic features were used in the work. For the assessment of total height (B-v), body length (B-vs), length of the lower limbs (B-sy) and arm span (da3-da3) an anthropometer by GPM Anthropological Instruments was used. To assess the width of the shoulders (a-a) and hips (ic-ic), an awning clamp from the same company was used. The body weight was measured using the electronic balance. In contrast, the periphery of the body was measured with anthropometric tape: thorax, hips, thighs, lower legs, arm, both in tension and at rest. The Harpenden type tasometer, which is characterized by a constant pressure force of 10g / mm², skin-fat folds were measured under the lower blade angle, above the triceps muscles of the arm, as well as on the abdomen and undercut. The BMI index was calculated.

The inter-group variation of individual variables, determined by the Student's t-test, was used for statistical analysis. In addition, the average value and the standard deviation were calculated for each parameter. All measurements were taken for using a computer program for STATISTICA 6.0 PL calculations.

Results

Table 1 presents statistical characteristics of the examined height, length and width features. Of the given features, the seat height shows a statistically significant difference. The comparison of features indicates an increase in value between the first and the second study.

Table 1. Statistic of height, length and width characteristics in two studies.

Variable	Study 1		Study 2		T-test
	x	s	x	s	p level
Body height (cm)	177,0	7,9	180,0	7,7	0,074
Sitting height (cm)	91,1	3,8	93,3	4,0	0,009
Length of the lower limbs (cm)	86,0	4,8	86,7	4,7	0,439
Arm span (cm)	178,0	9,6	180,7	9,0	0,173
Shoulder width (cm)	40,2	2,6	41,1	2,1	0,065
Hip width (cm)	28,1	2,0	28,8	2,0	0,089

Very significant differences between the tests occurred in the body's circuits (Table 2). Only the chest circumference does not show statistically significant differentiation. The comparison of tests indicates regression of circuits in all measured features between the first study and the second study.

Table 2. Statistics of body circumferences in two studies

Variable	Study 1		Study 2		T-test
	x	s	x	s	p level
Circuit chest (cm)	86,8	6,4	85,5	6,1	0,307
Circuit arm in rest (cm)	27,4	2,6	25,9	2,3	0,005
Circuit arm in tension (cm)	29,8	2,6	28,2	2,6	0,006
Circuit thigh (cm)	58,3	5,4	55,9	4,6	0,023
Circuit shin (cm)	37,2	3,1	35,4	2,6	0,004

On the basis of the measurement of the thickness of skin-fat folds, body fat was assessed, which was larger in the first study (Table 3). Slimmer folds, which are statistically significant, were noted at the fatty fold on the abdomen and on the back. In the case of body weight and BMI, no significant changes were noticed.

Table 3. Statistical characteristics of skinfolds, weight, and BMI in two studies

Variable	Study 1		Study 2		T-test
	x	s	x	s	p level
Folds. on an arm (mm)	12,6	4,0	11,7	4,1	0,288
Folds. on the abdomen (mm)	15,3	5,8	12,8	5,0	0,029
Folds. the blade (mm)	8,4	2,9	8,2	2,7	0,738
Folds. on the shank (mm)	9,4	3,5	7,0	2,8	0,001
Body weight (kg)	64,2	10,3	65,6	10,0	0,513
BMI	20,4	2,3	20,2	2,2	0,644

Discussion

The proportions of the body structure and its size are strongly genetically conditioned, but also shape under the influence of the environment. In research on intergenerational conversions in the physique of children and adolescents, the puberty spike was marked at the age of 11-13 (Kowal et al., 2011). Comparing the development of somatic structure and physical efficiency of 16-18 summer volleyball players Boraczyński et al. (2012) established that the final body height would reach the age of 17.

The conducted research showed that volleyballers from Lower Silesia considerably develop length and width features. The results of the analysis of the teams participation in the World Volleyball Championship in 2014, informed that the average body height of the players from 1-4 places was 199.7 cm. It should be noted that the teams that took 21st place in the competition were characterized by an average body height of 196,14 cm (Wnorowski and Ciemiński, 2016). Criteria for verification in terms of height and body length features are an important determinant of the player's potential for youth selection, and the trend of modern volleyball leads to a much more dynamic game than a few years ago, which means that more and more individuals are predisposed to this sport (Stawarski, 1967).

Research of Wnorowski and Ciemiński (2016) show the features of players playing professionally at the highest world level. Comparing the seats occupied at the World Cup by the best teams in tournament like Poland, Brazil, Germany and France, they achieve an average body weight of 91.21 kg and it is almost 4 kg more than teams from places 21-24. In turn, studies by Cabral and others (2008) on a selected youth representation of Brazil (14-17 years) show that they are characterized by above average weight (87.4 kg). Gjinovci et al.

(2014) in the material collected on the basis of the research of two leading teams from the Super League of Kosovo do not show significant differences in the average height and weight of these teams. However these values are much smaller than the average achieved by the World Cup in Poland, which may suggest that the level of this league is not the highest.

Nejić and Marković (2011) assessed the body's circumferences among Serbian teenage volleyball players in the team from Niš, the test group achieved significantly higher scores than their peers who did not play volleyball. However, in the aspect of chest circumference, arm circumference in tension and thighs, these values were smaller than the groups of representative volleyball players.

Germano-Muniz et al. (2017) on the basis of research on Brazilian volleyball players aged between 16 and 21, stated that the largest number of skinfolds is located in the abdominal region and subsequently on the iliac crest. However, the smallest value was recorded near the biceps muscle. Koley et al. (2010) on players practicing volleyball in Indian universities, also show volleyball players, as a group among which skin-fat folds on the biceps arm are the smallest. Tested volleyballers of youth groups from the Lower Silesia region are characterized by changes in the value of these properties after several months.

Research shows that there are significant differences in the body structure of players practicing volleyball, differentiating a given group due to the sports level and age.

Summary

Based on the analysis of test results among teenage volleyball players, it can be stated that in the course of several months there have been changes in somatic construction. The most significant changes were observed in altitude aspects, where further development of features such as body height and seat height was noted. Intensive development of the skeletal system in a short time, also significantly affected changes in the muscular system. Of the five peripheral features studied, regression was observed in all of them, which may prove the prolongation of individual body segments under the influence of skeletal development and muscle weakness. The development of the above features also caused a decrease in the values obtained in the measurement of skin-fat folds.

The conducted research confirmed further somatic development of athletes aged 14-15. Changes occurring during the development of individual traits should be used and analyzed by trainers during selection to the next stages of volleyball development, as well as help in the individualization of the training process.

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