Parameters of strength fitness in athletes from various team sports

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Abstract

Objective of the study was to identify the parameters of strength fitness of athletes of different skill levels from various team sports and conduct a comparative analysis of the data obtained.

Methods and structure of the study. The following research methods were applied: theoretical analysis; testing; mathematical statistics. Sampled for the study were 117 handball players, 118 volleyball players, 114 basketball players, and 127 football players (qualified from Class III to Masters of Sports). The relative strength rates in the subjects' muscle groups were determined using the generally accepted method of B.M. Rybalko and B.M. Abalakov's test (dynamometry).

Results and conclusions. The experimental research under the supervision of Professor G.N. Maksimenko and further comparative analysis of the data obtained revealed the relative strength indices in different muscle groups of volleyball, handball, basketball, and football players with sports qualifications from Class III to Masters of Sports. The sports progress from Class III to Masters of Sports in the studied groups was accompanied by a statistically significant increase in the athletes' relative strength rates (and hence, absolute strength rates). The highest aggregate values of relative strength in the 5 leg muscle groups were recorded in the Masters of Sport in football (6.04±0.04 kg).

Simultaneously with the identification of the parameters of development of strength qualities of various muscle groups, we conducted a comparative analysis of the data obtained in the athletes from various team sports with sports qualifications from Class III to Masters of Sports. The findings conform to the modern scientific idea that sports progress and improvement of competitive performance in team sports largely depends on the level of development of strength qualities of individual muscle groups [3, 4]. The growth of sports skills is accompanied by a statistically significant increase in the strength of particular muscle groups.

Keywords: *relative strength, muscle groups, team sports.*

Background. Current scientific studies indicate the relevance of the issue of enhancement of athletic training in various team sports [1-4]. Most of the studies [2, 4] do not provide answers to the questions concerning the optimal strength value for each team sport, the muscle groups to be developed in athletes depending on their sports specialization, and the strength fitness parameters to be taken into account when planning the process of training of athletes qualified from Class III to Masters of Sports.

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Results and discussion. As the Table shows, with the growth of sports mastery of the handball players, the relative strength rates in the studied muscle groups increased, which reached their maximum values in the Masters of Sport. This was especially noticeable in the aggregate strength values of 5 and 8 muscle groups. It should be noted that the relative strength rates in the handball players increased with the increase of their body mass in the process of building sports mastery from Class III to Masters of Sports. A total of 118 volleyball players with different skill levels were tested for the strength of the same muscle groups as the handball players. Besides, we tested the strength level of the trunk flexors. Thus, we detected the improvement of relative strength rates in the volleyball players accompanied by the growth of their sports skills. At the same time, as with the handball players, the most pronounced increase in the strength rates was observed in the aggregate values of strength of the 5 and 10 muscle groups. The testing of 114 basketball players with different sports qualifications showed a high level of correlation between their sports mastery level and relative strength of the following muscle groups: hip flexor and extensor muscles, ankle flexor and extensor muscles, plantarflexor, shoulder flexor and extensor muscles, forearm extensor, wrist flexor; adductor muscles of the shoulder, and trunk flexor and extensor muscles. The correlation "sports result - relative strength development level" was especially noticeable in the dynamics of the aggregate values. The muscle group strength test rates in 127 football players were found to have a similar tendency to increase. In the football players, the most informative and reliable indicators were obtained in the hip flexor and extensor muscles, ankle flexor and extensor muscles, and plantarflexor.

Conclusions. The study has made it possible to determine the parameters of development of strength qualities of various muscle groups of athletes from various team sports with diriment sports

Table 1. *Relative strength rates in handball players with different sports qualifications*

Muscle group strength rates (kg)	Sport qualification						
	Master of Sport		Class I		Class II		Class III
	$\bar{X} \pm m$	p	$\bar{X} \pm m$	p	$\bar{X} \pm m$	p	$\bar{X} \pm m$
Aggregate values of relative strength: hip flexor hip extensor ankle flexor ankle extensor plantarflexor	0.54±0.01 1.81±0.02 0.42±0.01 0.72±0.01 2.23±0.03	<0.01 <0.01 <0.01 >0.05 >0.05	0.38±0.02 2.04±0.03 0.31±0.02 0.75±0.04 2.14±0.05	<0.01 >0.05 >0.05 >0.05 <0.05	0.32±0.02 1.69±0.04 0.26±0.01 0.66±0.03 1.95±0.05	<0.01 >0.05 <0.05 >0.05 <0.05	0.4±0.02 1.5±0.05 0.35±0.02 0.64±0.03 1.62±0.05
Aggregate values of relative strength in the leg muscle groups	5.73±0.09	>0.05	5.65±0.08	<0.01	4.94±0.11	<0.05	4.60±0.1
Aggregate values of relative strength: adductor muscles of the shoulder shoulder extensors forearm extensors	0.8±0.01 0.8±0.01 0.39±0.01	>0.05 >0.05 >0.05	0.76±0.01 0.78±0.02 0.35±0.01	<0.01 <0.01 <0.01	0.6±0.02 0.61±0.02 0.22±0.01	>0.05 >0.05 >0.05	0.62±0.03 0.65±0.02 0.23±0.01
Aggregate values of relative strength in the 3 arm muscle groups	2.00±0.03	>0.05	1.90±0.06	<0.01	1.44±0.04	>0.05	1.51±0.06
Aggregate values of relative strength in the 8 muscle groups	7.73±0.11	>0.05	7.55±0.12	<0.01	6.38±0.11	>0.05	6.11±0.15

qualifications: from Class III to Masters of Sports. The data obtained were subjected to a comparative analysis. The findings conform to the modern scientific idea that the growth of sports mastery and improvement of competitive performance in team sports largely depends on the level of development of strength qualities of individual muscle groups [3, 4]. The growth of sports mastery from Class III to Masters of Sports in the studied team sports was accompanied by a statistically significant increase in the athletes' relative strength rates (and hence, absolute strength rates). For example, the highest aggregate values of relative strength in the 5 leg muscle groups were recorded in the Masters of Sport in football (6.04 0.04 kg).

The study data and findings can be used as benchmarks for monitoring the level of development of strength qualities of athletes of different skill levels from various team sports, which will ensure that such principles are put into practice thus focusing on the achievement of elite sportsmanship and proportionality in the development of the basic motor skills. The prospects for further scientific research may be based on the need to study the contribution of each of the motor qualities parameters to sports results in various team sports.

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