

Features of the development of strength training of highly qualified football referees in the competitive period

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Abstract

Purpose: to identify the features of the development of strength training of highly qualified football referees in the competitive period.

Material & Methods: the study involved 30 highly qualified football referees aged 35-42: 4 FIFA referees, 15 Premier League referees and 11 First League referees.

Results: the training program for strength development in the competitive period included new fitness training tools using TRX® functional loops, step platform, BOSU hemisphere, 6D sliding. In the preparatory and final part of the training session, we included MFR exercises to fill the muscles with the maximum volume of blood and activate the nerve centers for their additional stretching. The results of testing the physical fitness of highly qualified referees at the beginning and end of the competitive period indicate that the training program developed by us, aimed at developing strength in competitive microcycles, most significantly influenced the increase in the manifestation of strength qualities in flexion and extension of the arms in emphasis. 8% and speed endurance in the YO-YO test - by 15,1%. There was also an improvement in the results in the manifestations of speed by 7.4% and by 2.3% in the 40 m run and the 4x10 m shuttle run, as well as by 5,7% in the speed-strength abilities in the standing long jump test.

Conclusions: the results of the study indicate the effectiveness of the strength training program for referees of different levels and qualifications and its use in training microcycles of the competitive period to improve physical fitness.

Анотація

Анатолій Абдула, Андрій Перцухов, Крцисцьоф Вноровський, Світлана Можаровська, Юрій Можаровський. Особливості розвитку силової підготовки футбольних арбітрів високої кваліфікації у змагальному періоді. **Мета:** виявити особливості розвитку силової підготовки футбольних арбітрів високої кваліфікації у змагальному періоді. **Матеріал і методи:** у дослідженні приймали участь 30 футбольних арбітрів 35-42 років високої кваліфікації: 4 арбітри FIFA, 15 арбітрів Прем'єр-ліги та 11 арбітрів Першої ліги. **Результати:** в програму тренувань для розвитку сили у змагальному періоді були включені нові засоби фітнес-тренування з використанням функціональних петель TRX®, степ-платформи, полу-сфери BOSU, 6D sliding. В підготовчій та заключній частинах тренувального заняття нами були включені вправи МФР, щоб наповнити м'язи максимальним об'ємом крові та активізувати нервові центри для додаткового їх розтягування. Результати тестування фізичної підготовленості арбітрів високої кваліфікації на початку та наприкінці змагального періоду свідчать про те, що розроблена нами програма тренувань, спрямована на розвиток сили у змагальних мікроциклах, найбільш суттєво вплинула на приріст прояву силових якостей у згинанні та розгинанні рук в упорі лежачи на 27,8 % та швидкісної витривалості в тесті YO-YO - на 15,1 %. Також спостерігалось покращення результатів в проявах швидкості на 7,4 % та на 2,3 % у бігу на 40 м та човниковому бігу 4x10 м, а також на 5,7 % швидкісно-силових здібностей в тесті стрибок у довжину з місця. **Висновки:** результати дослідження свідчать про ефективність програми силової підготовки та використання її у тренувальних мікроциклах змагального періоду арбітрів різного рівня і кваліфікацій для покращення фізичної підготовленості.

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Introduction

Football arbitrage, first of all, depends on the dynamics and development of modern football. The speed of attacks, the movement of players, the ability of players to use long passes - all this requires the referee to have appropriate physical fitness (Lisenchuk et al., 2021, Pertsukhov & Perevoznik 2019). In order to make the right decisions on the football field, the referee must always be near the game episode, which is determined by proper physical activity during the game.

Many leading experts were engaged in the study of the physical training of referees in football. Some believe that the level of physical fitness of referees largely depends on such physical qualities as endurance and speed (Helsen & Bultynck., 2004).

In addition, Vykrov (2005) argues that the psychological state of the referee has a significant influence on the physical preparation during the match.

In turn, Nikolaienko & Chopilko (2020) emphasize that when changing the direction and running technique, the football referee is significantly affected by the development of agility and coordination.

Baydemir et al., (2021) argue that high-intensity running and sprinting should be the main means of football referee training.

In recent years, in the educational and training process of athletes whose activities are related to motor activity, exercises are often used to develop strength (Kokareva et al., 2018, Mac Innis & Gibala, 2017, Platonov, 2017, Seluianov et al., 2019). In football arbitration, a sufficient level of strength training is necessary for a constant change of direction, jerks, and unexpected stops. Also, the presence of a certain margin of strength of muscles and ligaments significantly reduces the possibility of injury during a game or training (Bangsbo, 2004, Pacholek & Zemkova, 2020, Cherepanov & Mukhamadyev, 2012, Pamela et al., 2018).

In our opinion, strength exercises can affect not only the strength development, but also other types of football referees' physical fitness. However, there were no scientific works related to the study of the strength training of referees in football, which determined the relevance of our study.

Purpose of the study: to identify the features of the development of strength training of highly qualified football referees in the competitive period.

Material and Methods of the research

Participants

The study involved 30 highly qualified football referees aged 35-42 (average age 37,4 years): 4 FIFA referees, 15 Premier League referees and 11 First League referees. All referees gave informed consent to participate in the study.

Methods

To solve the tasks set in the work, the following research methods were used: analysis of scientific and methodological literature, pedagogical testing of referees' physical fitness, methods of mathematical statistics.

Pedagogical testing was carried out at the beginning and end of the competitive period in order to identify the effectiveness of means and methods of strength training, which were included in the training process of football referees.

To assess the level of physical fitness of referees, control studies were carried out using a battery of tests recommended

by the committee of referees of the Ukrainian Football Association (UAF) and approved by the European Union of Football Associations (UEFA) to diagnose the level of physical fitness of referees in accordance with age limits and the level of sports qualification. The selection of tests and control exercises for the study of the physical fitness of referees was made taking into account the FIFA requirements for referees and assistant referees of various categories, previously and now being introduced into practice (Derdo et al., 2019).

To assess the speed qualities, the run time of 40 meters and the shuttle run 4x10 m from a high start were determined. Two attempts were given, the best result was chosen and the corresponding calculations were carried out. The referee started the movement from a high start. The run time of 40 m must be at least 6,0 s, and the run time of 4x10 m must be at least 9,6 s.

To assess the speed-strength qualities:

- measured the length of the jump from the place by pushing off two legs. The referee stood on the line of the jump, after a preparatory semi-squat he jumped up and forward, using the swinging movements of his arms, and landed at the maximum possible distance. The best result of two attempts was recorded. The result of the jump must be at least 23,5 cm.

To assess special endurance, the total time of running the Yo-Yo test was determined. The referee ran a distance of 2x20 m with rest pauses and a gradual increase in speed. Referees conducting matches of professional teams must run up to the level of 18,2 – 14,33 minutes.

Push-ups were used to assess strength development. The starting position is an emphasis lying on a support (field), the body is straightened, without bending at the hip joints, the shoulders are above the hands, the hands are at a shoulder-width distance from each other and directed forward. Result not less than 40 times (Derdo et al., 2019).

Procedure

The study was carried out in several stages. At the first stage, the analysis and generalization of scientific and methodological literature was carried out, which made it possible to study the state of the problem under study. At the second stage, a program of strength training of training microcycles was developed using modern fitness training tools and testing of the level of physical fitness of referees at the beginning of the competitive period was carried out. At the third stage, final testing was carried out at the end of the competitive period to determine the effectiveness of the implemented strength training program, processing and comparative analysis of the results obtained were carried out, and conclusions of the study were drawn.

Statistical analysis

The obtained data were processed using the statistical package of Excel XP. Mathematical and statistical methods included: calculation of arithmetic average characteristics - \bar{X} ; standard error of the mean - m ; Student's t-test, which determined the degree of significance of the difference in indicators.

Results of the research

To develop the strength training of football referees, we developed a special program that we used in the training microcycles of the competitive period. The training microcycles of the competition period included new fitness training tools using TRX® functional loops, a step platform,

Table 1

Indicators of physical fitness of referees in football during the competitive period (n 30)

Tests	At the beginning of the competition period	At the end of the competition period	t	p
	$\bar{X}_1 \pm m_1$	$\bar{X}_2 \pm m_2$		
Running 40 m, s	5,84±0,09	5,41±0,1	3,20	<0,01
YO-YO test, min	14,33±0,23	16,44±0,11	2,86	<0,01
Standing long jump, m	2,31±0,05	2,44±0,03	2,23	<0,05
Push-ups, number of times	41,9±2,20	53,5±3,70	2,76	<0,01
Running 4x10, s	9,51±0,03	9,32±0,06	2,83	<0,01

BOSU hemispheres, 6D sliding, rubber shock absorbers and myofascial relaxation rolls (MFR).

The results of testing the physical fitness of football referees at the beginning of the competitive period are presented in Table 1. Thus, the average test results were as follows: 40 m run was 5,84±0,09 s, YO-YO test execution time was 14,33±0,23 min, standing long jump – 2,31±0,05 m, push-ups – 41,9±2,20 times and shuttle run 4x10 – 9,51±0,03 s. The level of indicators of physical fitness of referees after testing at the beginning of the competition period was average, and the 40 m run was below average according to the FIFA test evaluation scale (Petrov & Abdula, 2007).

After the implementation of the strength training program at the end of the competitive period, the physical training of football referees was retested. The test results are presented in Table 1. It should be noted that the selected means and methods of strength training significantly improved performance in all types of test exercises. Thus, in the 40m run, the result was 5,41±0,1 s, which is 0,43 s, 7,4% better than at the beginning of the competition period ($p<0,01$); the results improved by 15,1% in the YO-YO test and amounted to 16,44±0,11 min, ($p<0,01$), as well as by 5,7% in the standing long jump – 2,44±0,03 m ($p<0,01$), by 27,8% in push-ups – 53,5±3,70 times ($p<0,01$) and by 2.3% in running 4x10 m - 9,32±0,06 s ($p<0,01$).

Thus, a significant difference in the results of the physical fitness of referees in various types of testing allows us to assert the effectiveness of this technique not only in the manifestation of strength and speed-strength qualities (push-ups and standing long jump), but also in the development of speed endurance (YO-YO test) and speed (40m run and 4x10m run). Therefore, the development of strength according to our program with the use of new means of fitness training is positive and can be used in the training process of football referees.

Discussion

The training of a sports referee directly depends on the modern development of the sport in which the arbitration of competitions takes place. Research by Sant'anna et al., (2021) on the fitness of rugby referees suggests the need for more high-intensity training aimed at developing speed endurance, which is driven by playing activities during the game. Breklen et al., (2021) state that high-intensity training 3 times a week for basketball referees results in improved speed performance and reduced reaction time when making decisions on the basketball court. In turn, studies of the physical fitness of referees in handball proved that improving the results of special endurance in the training process significantly improves the efficiency of making the right

decisions during the game (Blob et al., 2022). The studies conducted by us in the competitive period of football referees confirm the need to include high-intensity exercises for the development of different types of endurance in the training microcycles, but in contrast to this, the referee must have a certain reserve of strength of the muscle groups that are most involved in such work, which will enable the body to withstand such a load. The results of our research have proved that the development of strength training in the competitive period also contributes to the improvement of the level of other physical qualities necessary for the high-quality work of the referee during the game.

Strength is fundamental to all aspects of fitness in most sports, especially those that involve various forms of running such as sprinting, turning, and changing direction. By including strength development tools in the training process, one can not only increase muscle power, but also improve the athlete's physical qualities and prevent the occurrence of most mechanical injuries (Cherepanov & Mukhamadyev, 2012, Paes et al., 2011). The results of our research have shown the need to use means of strength training to improve the level of strength, as well as speed and endurance.

When planning the training process, the development of general strength training is carried out mainly in the preparatory period. In the competitive period, special strength training comes to the fore (Platonov, 2017, Petrov & Abdula, 2007). However, a complete rejection of the development of maximum strength is a mistake, first of all, in those sports where special requirements are placed on high-speed movement. The strength qualities of an athlete, brought to a high level of development in the preparatory period, cannot remain at the proper level during the playing season, therefore, in the competitive period, due attention should be paid to the development of maximum strength, speed-strength qualities and strength endurance at least twice a week (Pamela et al. 2018, Abdula 2018). The experimental data of our study supplement the knowledge of the authors about the features of strength development in the training process of the competitive period of athletes and confirm the need to include strength-oriented training 2-3 times a week.

According to experts in the field of theory and methodology of sports training (Charmi et al., 2020, Pacholek & Zemkova, 2020, Paul et al., 2018), new approaches to the functional training of athletes using modern training devices: TRX®, BOSU hemispheres, 6 -D Sliding, rubber shock absorbers are among the hottest trends in recent years and promote the development of all muscles, combining stability, mobility, strength and flexibility into a single whole - everything that athletes need, especially in sports with complex movements (Bangsbo 2004, Paul et al 2018). Our study is consistent with the data of specialists on the positive impact of modern

training devices in the training of athletes, but it should be noted that their selection should be generally accessible and easy to use, since each football referee spends most of the time of the training process independently and complex new fitness equipment. do not give a positive effect due to the lack of constant control over the correct technique for performing exercises.

Testing the physical fitness of Ukrainian referees takes place 4 times a year under the FIFA referee training program and includes speed endurance in the YO-YO test and speed in the 60-meter run test (Derdo et al., 2019). LaPlaca et al., (2020) recommend that testing the physical fitness of football players include exercises of speed-strength qualities (high jump, long jump), which is informative for team sports. It should be noted that the spectacular test tasks of the physical fitness of athletes whose activities are associated with a change in the direction of movement are shuttle running and its varieties, which includes manifestations of speed-strength qualities (Pamela et al., 2018). The selection of the battery of tests of our study was first developed in such a way as to be able to conduct a deep analysis and dynamics of the development of the main physical qualities of football referees in the competitive period, as well as include them in the control of the physical fitness of referees of various qualifications.

Subsequent studies will be devoted to the peculiarities of the construction of the training process of referees in the annual training cycle.

Conclusions

The results of our research have revealed the peculiarities of using the means of strength training of football referees in the competitive period. Thus, the development of strength training in the competitive period with the help of new means of fitness training helps to improve the level of indicators of other physical qualities necessary for the effective work of the referee during the game. The most significant increase occurred in the manifestation of strength qualities in push-ups by 27,8% and speed endurance in the YO-YO test – by 15,1%. There was also an improvement in the results in the manifestation of speed by 7,4% and by 2,3% in running 4x10 m, as well as by 5.7% in speed-strength abilities in the standing long jump. The results of the study indicate the need to include a strength training program in the training microcycles of referees of different levels and qualifications in order to improve physical fitness and prevent injuries during the playing season.

Author Contributions

Abdula Anatoliy: data analysis, statistics, data interpretation, manuscript preparation; Pertsukhov Andrii: data collection, input; Krzysztof Wnorowski: design, research planning; Mozharovska Svitlana: data analysis, literature search; Mozharovskyy Yuriy: data analysis, literature search.

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Conflicts of Interest

The authors declare no conflict of interest.

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