



Development of speed endurance of children of 13 to 14 years of age attending football classes

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Abstract

The relevance of the problem under research is determined by the fact that researches and practical guidance for improvement of physical condition of football players of 13 to 14 years of age have poor representation in scientific and methodological literature. This problem poses a great theoretical and practical value for training both highly skilled football players and athletes of mass athletic titles. The purpose of this article is to elaborate a method for improvement of speed endurance of football players of 13 to 14 years of age and to test the efficiency of the method. The top method for researching of this problem is analyzing the scientific and methodological literature, conducting a pedagogical experiment and performing monitoring tests. The main feature of this article is elaboration of a method for improvement of speed endurance of football players of 13 to 14 years of age and validation of efficiency of the method by means of conducting 30 meter test runs. The materials of this article may be found useful by students of physical education and sports departments, physical education teachers of general schools, vocational and higher educational institutions, as well by teachers of extended educational system.

Keywords: physical training, speed endurance, football, special running exercises, middle school age

Skitnevskiy VL, Balashova VF, Grigoryeva EL, Kozlov VI, Sedov IA, Krasilnikova YS, Smirnov SA (2020) Development of speed endurance of children of 13 to 14 years of age attending football classes. *Eurasia J Biosci* 14: 3401-3407.

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INTRODUCTION

The modern sports training system is determined by the requirement to constantly search for ways to improve the efficiency of the training process. Therefore, elaboration and implementation of new techniques is essential for achieving success (Kolupanov, 2009; Erina & Kayumova, 2017; Oborsky et al., 2018; Podymov et al., 2019).

Numerous scientific researches, as well as historical football practice have proven that high level of physical fitness of football players is the major driver of successful implementation of techniques and tactics during matches (Akishina et al., 2017; Kuznetsova et al., 2018). Therefore, regardless of the qualification, physical fitness is the foundation of the whole training process of football players (Godik, 2006; Kolupanov, 2010; Kolupanov & Ignatiyev, 2010a).

A well-organized method of improving speed endurance shall be based upon the knowledge of morphofunctional peculiarities of the process. As it is commonly known, the growth and development of a growing organism happen in an uneven manner:

usually, growth precedes development of muscles and life support systems, which is critical to account during planning of endurance development process, paying extra attention to balancing training loads. The growth of the skeleton and muscles of a teenager happen much faster than the growth of internal organs – such as heart and lungs, meaning that the respiratory and blood circulation systems are not sufficiently ready. Therefore, during the period of rapid growth it is imperative to pay attention to the amount of training loads imposed on young athletes as developed state of an athlete's body does not suggest that the internal systems of the organism have fully developed. It is best to avoid continuous loads as well as numerous repetitions of cyclic exercises (Farfel, 2000).

Speed endurance and training of speed endurance during early specialization shall make it clear that a response to continuous loads on adult and adolescent organisms will differ. The undeveloped functional

Received: August 2019

Accepted: March 2020

Printed: September 2020

systems of teenagers will produce various responses to aerobic loads, and it shall be taken into account by the trainer during training process and pre-season preparations, which in any sport means significant loads related to general endurance (Kuznetsov & Kholodov, 2000; Kolupanov & Ignatiyev, 2010b).

The main method to improve speed endurance is running training distances at a speed close to, equal to or slightly superseding critical. In terms of its effect, such exercise should provide maximum consumption of oxygen by the organism and ensure its retention at higher level for longer period of times. The process of providing energy for the working muscles is combined: predominantly aerobic with anaerobic component (Maksimenko, 2005; Kolupanov & Levin, 2010; Kayumova, 2016; Avdeev et al., 2019).

To improve endurance in this area of power, it is common to use predominantly variable, repetitive and interval methods. The intensity of movements of the variable method may range from medium to competitive. Variable training may be held in the form of Fartlek: running different lengths of distances with different speed; or by means of running the same lengths of distances with high and low speed. Specialized scientific and methodological literature contains number of works that consider improvement of certain physical qualities or aspects of general and special physical training (Zhilkin, 2005; Panin, 2005; Khairullina et al., 2020).

With that being said, in reality there are no researches or practical recommendations to improve efficiency of physical training of football players of 13 to 14 years of age. This problem poses a great theoretical and practical value for training both highly skilled football players and athletes of mass athletic titles. Our research was devoted to the development of this urgent issue.

Currently the level of football is constantly improving: both technical and functional abilities of players advance every year. During the match, each football player is in charge of performing defensive or attacking kicks on a certain section of the field. It is required of the player to be ready to experience loads and demonstrate physical abilities obtained during training. From one study it has become known that during one match a football player covers a distance of 5.5 to 10.5 kilometers, and the maximum speed can be achieved and maintained at a distance of 30 meters at most (Sarsania, 2003; Monakov, 2005).

MATERIALS AND METHODS

Definitions

Physical training – is a pedagogical process aimed at training of physical qualities and improvement of functional abilities, creating favorable conditions for improving all aspects of training.

Speed endurance – is an ability to maintain high speed for the longest possible time.

Football – is a sport game between two teams of eleven players in each. The object of the game is to kick the ball into the goal of the opposing team.

Special running exercise – is an exercise aimed at training and improving certain technique elements of competitive exercises, as well as development of special physical abilities of an athlete (power, speed, endurance, flexibility, agility).

Middle school age (11 to 15 years) – is the age of transition from childhood to adolescence, characterized by global rearrangement of the body. A significant feature of adolescent thinking is its criticality. At this age, students like to solve problems, find similarities and differences, and define cause and consequence.

Review of literature related to the elaboration of method to develop speed endurance of football players of 13 to 14 years of age

Endurance – is an ability to sustain physical fatigue during muscular activity. Considering endurance as a physical quality, a lot of authors point out that expression of endurance is constantly dependant on combination of some qualities of an athlete's body. The experience of leading teachers and research result demonstrate that training of endurance is an important part of all-round physical training of athletes (Matveyev, 1977). A training session with a fairly large portion of exercises aimed at improving endurance, in a rational combination with other means of general physical training, contributes to an increase in the level of development not only of endurance, but also of speed, strength, and speed-power qualities (Suslina, 2012).

Based on the analysis of world records of different distance running, V.S. Farfel (2000) was able to define that the speed-time relationship breaks down into four straightforward sections that he called areas of relative power: area of maximal, sub maximal, high and moderate power. Each of these areas contains groups of distances existing in practice – short, medium, long and extra-long.

The main mean to improve speed endurance in the area of maximal power is running distances equal to or superseding the competitive distances with maximum or near maximum speed. In this case, we have in mind not the athlete's record speed, but the maximal speed in relation to an athlete's capabilities on the day of training (Kuramshin, 2003).

Until recently, the endurance was closely studied in order to determine the most optimum age for its building and maintaining, and it was largely confirmed that, despite the indicated sensitive periods of the formation of general endurance of a child, mature age of both male and female athletes sets the most extensive limits for formation and improvement of both general and special endurance. To this day numerous authors are convinced, and it is confirmed by experimental studies, that the maximum abilities of an adult's body aimed at building endurance flourish only after 20 years of age,

and are formed by milestones up until 35 years of age (Volkov et al., 2000).

Development of endurance as a motor quality of an athlete is a priority in any sport, and it is safe to say that improvement of general endurance determines the efficiency of improvement of an athlete's special endurance, directly correlating with a direct positive dependence, which indicates that the higher the level of general endurance in an athlete, the higher the level of special endurance. And any training at the beginning of an athlete's annual cycle always begins with buildup of loads by increasing elements aimed at improvement of general endurance (Savin, 1990; Solodkov & Sologubov, 2001).

Considering anatomic-physiological characteristics of children of 13 to 14 years of age engaged in physical education or sports activities, any impact on locomotor system during this period is bound to be successful, if training coach is well aware of developmental peculiarities of young athletes. Taking into account characteristics of a young organism, the level of its development at 13-14 years, it is necessary to select all training means and methods in accordance with the nature of its performance, load intensity, as well as taking the time of rest after the training required for a child's body to restore into consideration (Kolupanov, 2010).

At 13-14 years it is recommended to efficiently improve speed capabilities, as well as general level of functional abilities. That is why at this stage of long-term training there is a gradual and moderate increase of all running means of training. Aspects of developing weekly cycle, its content and focus at each stage of training are substantially different: each stage is characterized by a well-defined pattern, thus making it essential to master the art of optimal development of training program. Otherwise, the training will comprise only of physical education (Lyubimova, Marinova & Nikitina, 2003).

At the stage of defining the specialization (of training) of 13-14-year-old football players, weekly cycle shall include goals (patterns) to be routinely repeated at each weekly cycle. This is made to achieve the correctness of training and performance reliability (Lapshin, 2010).

Training of certain elements and techniques, as well as linking of these elements together requires large number of repetitions to be made with low intensity of the performed work. A set may seem inefficient, but the whole training happens gradually, in steps, despite all individual differences of the players. To cut a long story short, the method is based on self-learning. A football player knows what to do and how to do it, the only thing required is corresponding adjustments. During the second year (14 years), the weekly cycle changes and is now characterized by constant review of the material and improvement of techniques under different functional conditions. One of the peculiarities of the training during the second year is that performance of

exercise patterns occurs in the state of fatigue. It is essential to gradually transfer the skill to the appropriate level of physical activity. The skill may be reinforced after the game or exercises, as well as after improvement of general physical abilities (Smirnov & Dubrovskiy, 2001; Kozyreva, 2020; Serebrovskaya, Suvorova & Dunayeva, 2020).

In summary, the problem of the research is elaboration of a method to develop speed abilities of football players of 13 to 14 years of age.

The object of the research is special physical training of football players of 13 to 14 years of age.

The goal of the research is to elaborate a method to develop speed endurance of football players of 13 to 14 years of age and to test the efficiency of the elaborated method.

The hypothesis of the research is the assumption that an experimental method would be more efficient in development of speed endurance of young football players of 13 to 14 years.

RESULTS

Issues arising from elaboration of method to develop speed endurance of football players of 13 to 14 years of age.

Initial testing of groups of children of 13 to 14 years of age attending football club was performed by means of 30*10 meters run at the beginning of the research period. The results of the initial testing are given in **Fig. 1**.

The results of the initial testing show that the level of physical fitness of football players of 13 to 14 years of age on average is the same. Therefore it can be stated that before the research, the results of testing of football players showed only minor differences, the average values of the experimental group (EG) and reference group (RG) were about the same.

The final testing of groups of children of 13 to 14 years of age attending football club was performed by means of 30*10 meters run at the end of the period. The results of the final testing are shown in **Fig. 2**. $Q = Av_1 - Av_2$, where Q is the difference of average values of reference and experimental groups.

Comparison of the obtained data at the end of the research shows that even though the results of both groups improved, the results of the experimental group are significantly better, thus proving the efficiency of the elaborated method aimed at development of speed endurance.

The experimental group was trained according to the method of development of speed endurance. After having conducted the training exercises for the specified period of time, a second testing was held to define the efficiency of the elaborated method to develop speed endurance of children of 13 to 14 years of age attending experimental group of the football club.

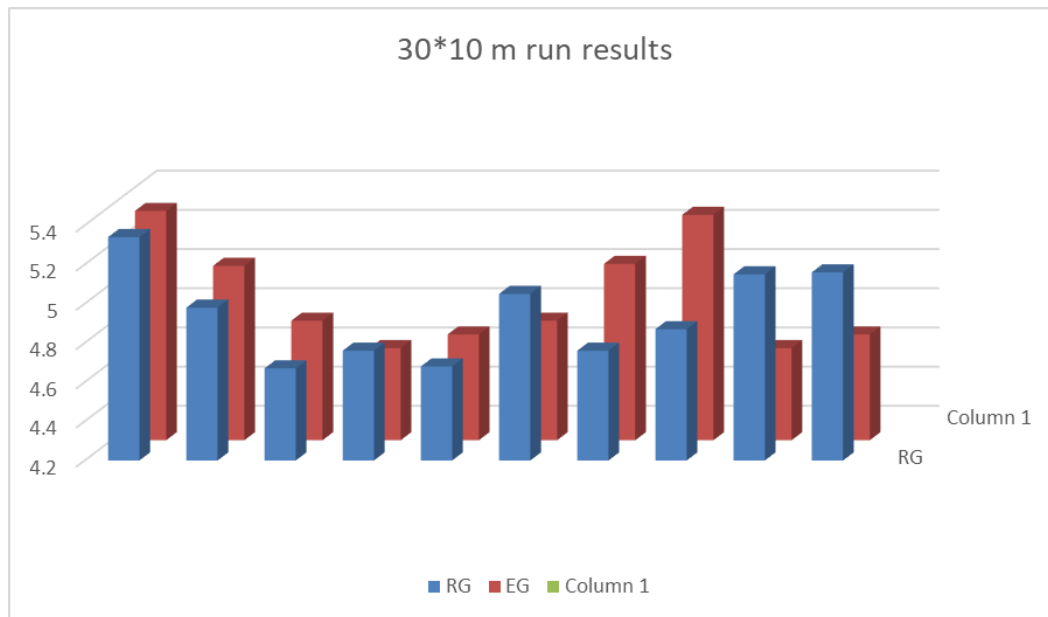


Fig. 1. Average results of the initial testing

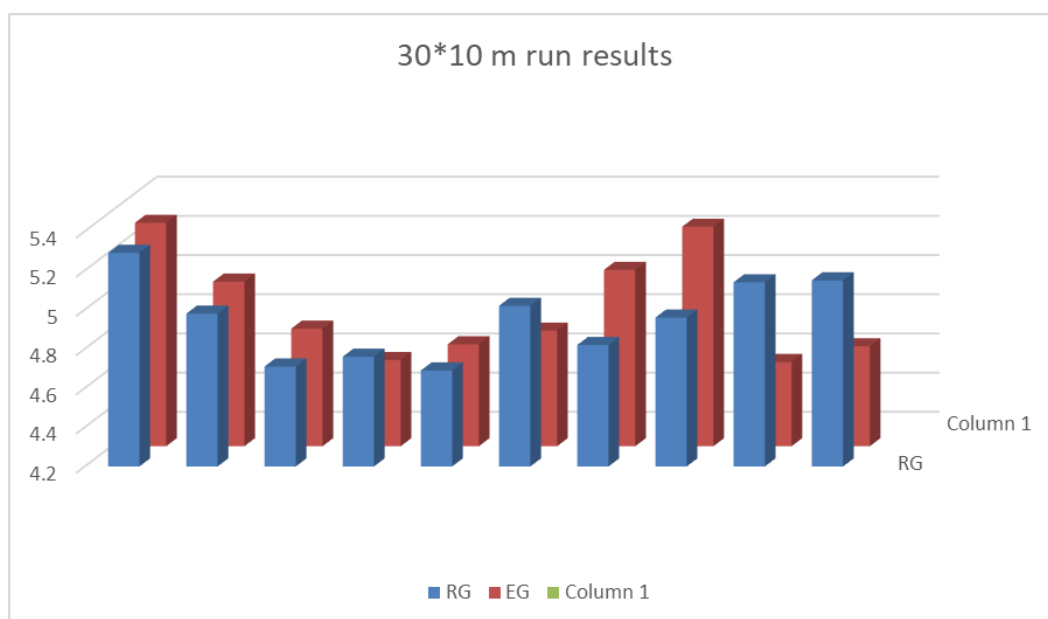


Fig. 2. Final testing results

Table 1. Experimental group

Test	Before	After	Significance of differences (p≤0.001)
30*10 meter run (c)	4.942±0.077	4.952±0.068	t=0.712 p>0.001

Table 2. Reference group

Test	Before	After	Significance of differences (p≤0.001)
30*10 meter run (c)	4.935±0.090	4.909±0.090	t= 5.455 p>0.001

Tables 1 and 2 demonstrate the calculation of significance of differences of test results.

Statistical processing of data at the beginning and at the end of the research revealed significant differences

of all proposed tests that were conducted to examine the speed endurance of young football players. It is worth noting that improvement of speed endurance was observed in both experimental and reference groups, yet the results of the experimental group were much higher.

In this regard it may be concluded that the proposed method is efficient for development of speed endurance.

In such a manner we tried to influence over the development of speed endurance as a part of the training program for young football players during the training sessions. The effectiveness of the proposed method is confirmed by testing and calculation of significance of differences with Student's t-test.

DISCUSSIONS

Issues arising from elaboration of method to develop speed endurance of football players of 13 to 14 years of age.

Assessment of the level of speed endurance of children of 13 to 14 years of age attending football club was performed through testing. Test 1. 30*10 meters run (Kolodnitskiy, Kuznetsov & Maslov, 2011).

Performed on a flat field without any surface damages. The trainer shall command "Ready! Steady! Go!" and a student shall run the given distance at maximum speed.

The following were also a part of the experimental method:

1. Maximum intensity repeated running for ten – sixty meters, and repeated running with close to maximum speed for twenty – one hundred fifty meters, side to side lateral run and straightforward run (aggressive hill pushes), vertical jumps, front knee lifts, butt kicks, variable run.
2. Sport games: volleyball, field handball, basketball, exercises with a minimum number of players possible and extended play time, games at fields of different size.
3. Load exercises performed with maximum speed (15-20 seconds exercising, max 5 kg load for the arms, 30-60 seconds rest, 4-5 repeats).
4. Staircase run and jumps, cross run with steady and variable pace at high speed and gradual increase of the distance.
5. Series of game and running exercises (exercising at submaximal power level for 30-40 seconds at max, 1.5-2 minutes rest, 4-5 repeats per one series, 1 to 3 series in total).
6. Repeated run at short distances of 30, 40, and 60 meters with short (15-30 seconds) rest.
7. Repeated run at short distances of 17, 30, 50 meters with short (15-30 seconds) rest.

The following characteristics determine sprint endurance:

1. Intensity – Mx heart rate is not always 190-200 bpm.
2. 15 to 60 meters distance.
3. Rest time depends on the distance – 15 m run requires 35-45 seconds rest; 30 m run requires 70-75 seconds rest; 60 m run requires 90-115

seconds rest. Increase of rest time ensures improvement of speed qualities. Heart rate = 140 bpm – before the next repeat \pm 10 bpm.

4. The main training method – repetitive.
5. The number of repeats depends on the distance in one series and may vary from 4 to 10 (30 meters – 6 to 8 repeats; 15 – 8 to 10 repeats).
6. Resting intervals: not to lose irritability of nervous processes (15 m – 30 sec; 30 m – 70 sec) between the series, the resting time shall be 7 to 8 minutes.
7. Number of repeats – 3.

The pedagogical experiment was held to prove the efficiency of the method aimed at improvement of speed endurance of children of 13 to 14 years of age, attending football club. The pedagogical experiment was held at "Dom Moskvyy" Football Club, at Balakhna town.

To try the method, a training group of students born in years 2003-2004 (trainer – Evgeniy S. Dorogov) was chosen. This group was divided into two sub-groups – 10 people in each. Each student was assigned to the sub-groups based on the results of test taken in 2016-2017 training year and based on an additional trainer's recommendations. Testing is performed twice a year: in May – assessment of general physical fitness level, and in February – assessment of special physical fitness level. A year cycle of training sessions of "Dom Moskvyy" Football Club, Balakhna includes three periods:

1. Preparatory (June, July, August, September);
2. Competitive (October, November, December, January, February, March);
3. Transitive (April, May).

Application of the experimental method was performed during the preparatory and competitive periods of the year training cycle. One of the sub-groups trained in accordance with the standard training method of the training program, while the other sub-group trained in accordance with the experimental method.

CONCLUSION

Speed abilities of a football player can be described as capabilities of a person that ensure execution of an action in the shortest time possible for the given conditions.

The level of development of speed abilities largely depends on capacities of many organs and body systems of a football player; among these are the following systems: cerebrospinal nervous, cardiovascular, respiratory, endocrine, thermoregulatory, and neuromuscular.

Demonstration of speed abilities depends on the level of development of other muscular abilities, technique and tactical abilities, stamina, emotional stability and body resistance to negative changes.

By considering various methods of development of speed endurance of young football players we were able

to identify that the influence of training exercises on the athlete's body depends on complex effect of key aspect of physical training: intensity and duration of the exercise, number of repetitions, resting time, and the nature of rest. The intensity of the training is linked directly to the energy generation abilities. Duration of the training is interdependent with its intensity. Duration of the resting time is the only feature that characterizes the extent and nature of body response to loads during repeated exercising. This is related to the fact that regeneration of body's capacity during the period of recreation is of a phase nature.

During the development of the experimental method we kept in mind that conditioning of young football players is a very complicated and a very long process. Some of the issues related to training of young football players have not yet been studied or have been studied

incompletely. Currently these issues require experimental research, although it is not possible to give all-purpose recommendations.

In order to find new ways of development of speed endurance of youngsters in football, we have elaborated the experimental method.

RECOMMENDATIONS

The materials of this article may be found useful by physical education teachers of general schools, trainers of children's sports schools, as well as by teachers of extended educational system working with children of middle school age. The developed method for improvement of speed abilities of children of 13 to 14 years of age may also be found useful by parents of children seeking improvement of speed abilities.

REFERENCES

- Akishina EM, Sudakova YE, Prokopyev AI, Yakubenko KY, Solovyeva NA, Korzhuev AV (2017) System of cultural experience development of humanities students in modern information media conditions. *Man in India*, 97(14): 115-127.
- Avdeev VA, Avdeeva OA, Shagieva RV, Smirnova VV, Mashkin NA, Taradonov SV (2019) The mechanism of legal regulation in the conditions of globalization and formation of information environment. *Regional aspect. Journal of Environmental Management and Tourism*, 10(7): 1517–152.
- Erina, I.A., Kayumova, L.R. (2017). The issue of the ethnic relations in a high school's conditions. *Man in India*, 97(15): 257-268.
- Farfel VS (2000) *Physiology of sport*. Moscow: Physical education and sport.
- Godik MA (2006) *Physical training of football players*. Main. Physical culture, Sport. Moscow: Terra-Sport, Olympia Press.
- Kayumova LR (2016) Formation of the noxologic educational environment in elementary school: Application of moderation technology. *Mathematics Education*, 11(4): 779-786.
- Khairullina ER, Shubovich MM, Bogdanova VI, Slepneva EV, Mashkin NA, Rodyukova TN (2020) Modern student youth civic identity: Political activity or social responsibility? *Opcion*, 36(Special Edition 27): 1703–1717.
- Kolodnitskiy GA, Kuznetsov VS, Maslov MV (2011) *Extracurricular activity of students. Field-and-track athletics*. Moscow: Prosveshcheniye.
- Kolupanov PP (2009) Psychological readiness of young football players of 13 to 14 years of age during competitions. *Urgent matters of rehabilitation in the XXI century. Materials of the II international conference of science and practice*. Moscow – Kaluga – Smolensk: Institution of social relations of Kaluga State University named after K.E. Tsiolkovskiy, 234-237.
- Kolupanov PP (2010) Factors determining the efficiency of competitive activity of football players in different age periods. *Theory and practice of physical education*, 1: 54 - 64.
- Kolupanov PP, Ignatiyev YV (2010a) Efficiency of integral method of training of young football players of 13 to 14 years of age during initial stage of training. *Prospects and guidelines for conditioning of the Olympic reserve and athletes of elite sports system: II international conference of science and practice*. Smolensk: Print-express, 148-150.
- Kolupanov PP, Ignatiyev YV (2010b) Criteria for assessing the technical and tactical fitness of football players. *Prospects and guidelines for conditioning of the Olympic reserve and athletes of elite sports system: II international conference of science and practice*. Smolensk: Print-express, 122-125.
- Kolupanov PP, Levin VS (2010) Dynamics of technical readiness of young football players of 13 to 14 years of age with application of integrated training methods. *Prospects and guidelines for conditioning of the Olympic reserve and athletes of elite sports system: II international conference of science and practice*. Smolensk: Print-express, 155-157.

- Kozyreva OA (2020) Pedagogical modeling in the professional activity of a teacher and academic worker. Vestnik of Minin University, 2(31): 1-19.
- Kuramshin YF (2003) Theory and methods of physical education. Moscow: Soviet sport.
- Kuznetsov VS, Kholodov ZhK (2000) Theory and methods of physical education and sport. Moscow: Akademiya publishing center.
- Kuznetsova NV, Soloviev AA, Botasheva LKh, Lebedev IA, Sarkisyan KS, Kurdyumov VI, Chistyakov KA, Prokopyev AI (2018) Bachelors safety culture formation in the field of environmental protection. EurAsian Journal of BioSciences, 12(2): 157-166.
- Lapshin OB (2010) Theory and methods of training of young football players. Moscow: Chelovek.
- Lyubimova ZV, Marinova KV, Nikitina AA (2003) Age physiology. Moscow: Vlados.
- Maksimenko AM (2005) Theory and methods of physical education. Moscow: Physical education.
- Matveyev LP (1977) Basics of physical training. Textbook for physical education institutions. Moscow: Physical education and sport.
- Monakov GV (2005) Conditioning of football players. Theory and practice. Moscow: Soviet Sport.
- Oborsky AY, Chistyakov AA, Prokopyev AI, Nikol'yukin SV, Chistyakov KA, Tararina LI (2018) The national mentality in the history of philosophy. XLinguae, 11(3): 158-165.
- Panin IN (2005) Russian football. Moscow: Soviet Sport.
- Podymov NA, Nikoghosyan MA, Stolyarova AN, Narutto SV, Mashkin NA, Martynenko SE, Paznikova ZI, Varenik PK (2019) University New Educational Reality in Disruptive Technologies Context. Journal of Environmental Treatment Techniques, 7(4): 664-668.
- Sarsania KS (2003) Try-outs and physical training of young football players: synopsis of a thesis: PhD Thesis. Moscow: RGUFK.
- Savin VP (1990) Football. Moscow: Physical education and sport.
- Serebrovskaya NE, Suvorova OV, Dunayeva NI (2020) A new look at the training of a coach in the higher professional education system. Vestnik of Minin University, 2(31): 13-27.
- Smirnov VM, Dubrovskiy VI (2001) Physiology of physical education and sport. Moscow: VLADOS-PRESS.
- Solodkov AS, Sologubov EB (2001) Human physiology. General. Sport. Age. Moscow: Terra-sport: Olympia-press.
- Suslina IV (2012) Physiological aspects of endurance in sport: textbook. Volgograd: FGBOU VPO VGAFK.
- Volkov NI, Nesen EN, Osipenko AA, Korsun SN (2003) Biochemistry of muscular activity. Moscow: Olympic literature.
- Zhilkin AI (2005) Field-and-track athletics. Moscow: Akademiya.