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Articles and Statements

Technology of Computer-assisted Technical Actions Training in Team Sports

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Abstract

When computer-assisted training is used the content is provided in a certain order with relatively small portions (steps). When developing training programmes of the basic elements of a hockey stick or ball handling, the number of steps depends on the complexity of the techniques to be trained. Each step of the programme includes introductory, informational, operational and control frames. The introductory frame is a pedagogical task of creating a motivation and an overview of the competitive activity. The informational frame is transfer of theoretical knowledge when studying a particular method of action (explanation, demonstration, repeated and contrast demonstration, demonstration accompanied by simultaneous explanation). The operational frame includes practical drills – the exercises aimed at mastering the action trained. The control frame serves to perform a test to check the quality of the techniques proficiency and the effectiveness of training.

The test and drills are performed on the playing ground with computer-controlled light emitters, generating unallowed light dynamic areas to be evaded by an athlete and/or sports implement. These areas emulate counter-players' actions and while moving, put obstacles on the athlete's way. The zones are moving following the course of straight lines up to meeting with the boundaries of the training area or among themselves. After colliding, as absolutely elastic bodies, they are moving until colliding again according to the laws of mechanics.

The technique training programme is selected, for example, consisting of two basic elements – groundmoves with the subsequent handling of the sports implement. When at the first step, the trainee evaluates the emulated game situation, adjusts his/her speed and technical capacities to the dynamics of unallowed zones movement and then, at the second step, he/she performs the groundmoves. If there are no errors, the diameter and/or the speed of the unallowed zones is increased until the trainee fails to accurately perform the action being trained. Then, having mastered the groundmoves, the trainee learns to perform the second element – passing the implement to one of the fellow trainees.

When testing the skill of the action handling, the diameter, the movement speed and the number of the unallowed areas are assigned according to the athlete's proficiency level.

Keywords: sport, team sports, technical actions, basic technical elements, computer-assisted training.

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1. Introduction

Technical actions training is more typical of the first, so-called basic stage of athlete's technical training, where the main (basic) elements of a hockey stick or a ball handling are receiving, passing, groundmoves, dribbling, tackling, steal, throw and shooting (Rami, 2011; Plotnikov, 2012; Bykov, 2012).

According to V.V. Plotnikov (Plotnikov, 2012), the pass and dribbling effectiveness in hockey is to be higher than 46-47%. According to V.V. Suvorov (Suvorov, 2007), the effectiveness of short, medium and long ball passing forward, momentum passing and dribbling of youth footballers is approximately 60%. However, they are used in the competitions relatively seldom as a result of inadequate training of those play elements. This hampers the execution of group tactical actions done by at least the player holding the ball and doing dribbling and the player he interacts with through the ball passing.

It is noted in paper (Afonshin, Rozhentsov, 2016a) that to achieve good level of basic technical elements proficiency multiple drill repetitions are required, but the uniformity and monotony of training sessions result in an athlete's psychological tiredness, fatigue and loss of interest. Therefore, when choosing training tools it is necessary to make a wider use of techniques to create a positive emotional background. This will not only ensure high performance, but will also contribute to a faster athlete's recovery after an intense workout.

In this regard, the search and study of new methods and techniques for application of emotional and comprehensive training aids to teach youth athletes to perform technical actions to enhance their overall proficiency is a prerequisite to improve training programmes in many sports (Maslo, 2010).

The use of information technologies for technical and tactical training in team sports were examined by the authors earlier, the method of technical (Afon'shin et al., 2014; Polevshchikov et al., 2014; Afonshin, Rozhentsov, 2016b) and tactical actions training by simulating game situations in the virtual reality (Rozhentsov, Afon'shin, 2013), technical and tactical training in team sports having been proposed (Rozhentsov, Afon'shin, 2014).

One of the promising ways of teaching motor actions in team sports, according to A.V. Bykov (Bykov, 2012), is the application of computer-assisted learning.

The purpose of this paper is to develop the technology of computer-assisted instruction of technical actions in sports.

The technology of computer-assisted technical actions training

The technology of computer-assisted training, according to A.I. Uman (Uman, 2012) and V.A. Kaver (Kavera, 2013), appeared in the early 1950s. It is at that time when the American psychologist B.F. Skinner firstly proposed to enhance the effectiveness of learning, having constructed it as a consistent programme of information submission and control. The technology of computer-assisted training involves learning of study material supported by training devices (computers, programmed textbook, etc.). The main feature of the technology is that all the study material is submitted in a strictly algorithmic order in relatively small portions (steps).

When developing the basic elements training programmes of a ball or a hockey stick handling it is important to take into account the biomechanical features of the technique and the general principles of programmed instruction. The number of steps in the training programmes for each basic element depends on the complexity of the certain technique. Each step of the programme includes introductory, informational, operational and control frames. The introductory frame is a pedagogical task to create a motivation and an overview of the competitive activity. The informational frame is transfer of theoretical knowledge when studying a particular action (explanation, demonstration, repeated and contrast demonstration, and demonstration accompanied by simultaneous explanation). The operational frame includes practical assignments – drills aimed at mastering the action trained. The control frame is to perform a test to check the quality of the technical action mastery and the effectiveness of learning (Bykov, 2012).

A test and drills are executed on the playing ground where computer-controlled light emitters generate highlighted unallowed zones for an athlete and/or an implement. The zones emulate the counteractions of the opponent players and while moving, hamper the athlete's movement. The zones are moving following the course of straight lines up to meeting with the boundaries of

the training area or among themselves. After colliding, as absolutely elastic bodies, they are moving until colliding again according to the laws of mechanics.

The technique training programme is selected, for example, consisting of two basic elements – groundmoves with the subsequent handling of the sports implement. When at the first step, the trainee evaluates the emulated game situation, adjusts his/her speed and technical capacities to the dynamics of unallowed zones movement and then, at the second step, he/she performs the groundmoves. If there are no errors, the diameter and/or the speed of the unallowed zones is increased until the trainee fails to accurately perform the action being trained. Then, having mastered the groundmoves, the trainee learns to perform the second element – passing the implement to one of the fellow trainees. The fragment of the drill to train groundmoves followed by ball passing is shown in Figure.

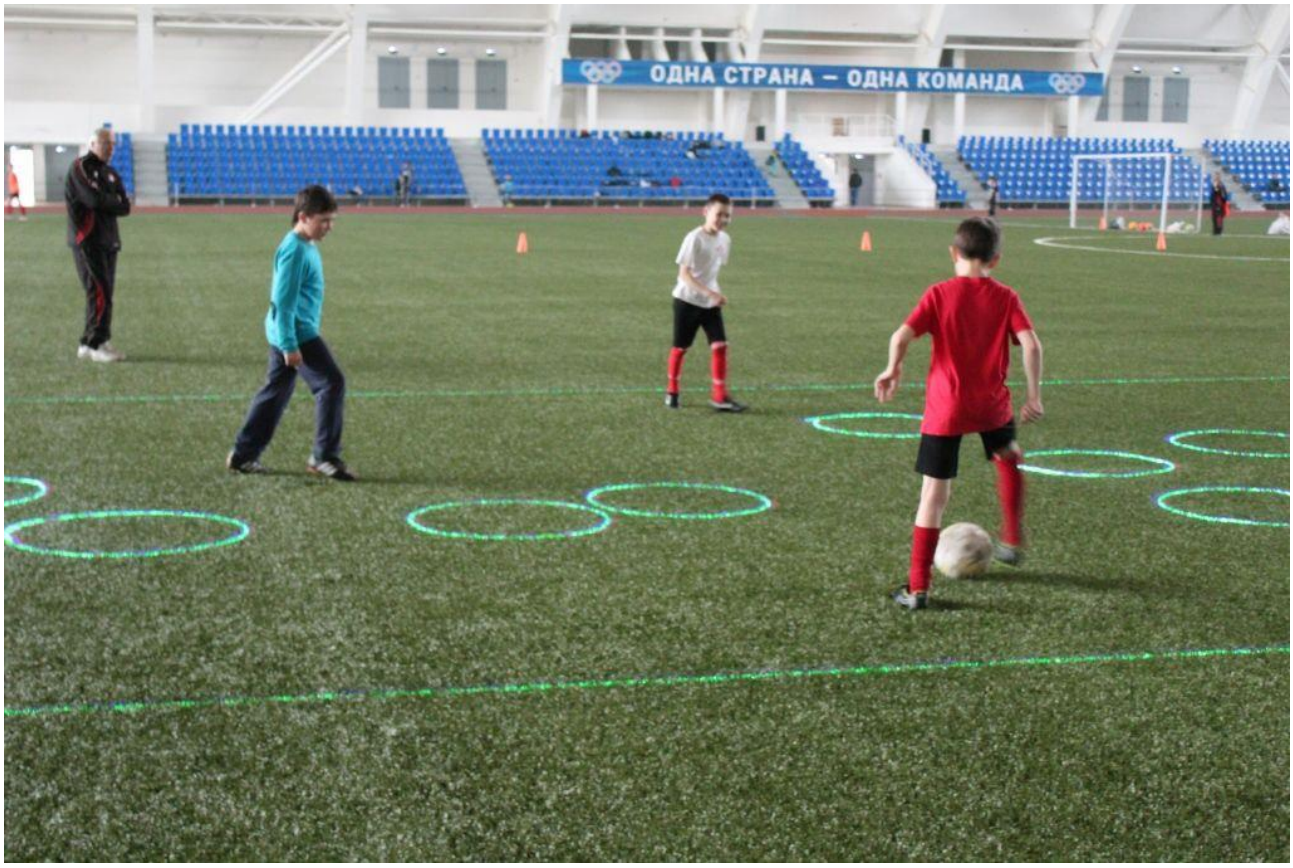

Fig. The fragment of the drill to train groundmoves followed by ball passing.

By the maximum moving speed and the diameter of the unallowed zones, the trainee's movement speed and the non-failure time while executing the drill they assess technical and tactical and physical fitness, the ability to see the playing ground, to foresee changes in the game situation and implement skills efficiently (Afon'shin, 2015).

When testing the mastery level the action trained, the diameter, the movement speed and the number of unallowed zones are assigned by the corresponding proficiency level.

2. Discussion

According to V.A. Kaver (Kavera, 2013), when developing the technology of computer-assisted training, N. Crowder developed so-called branching programmes, which depending on the learner's test results submitted different learning material for independent work. The domestic pedagogical school is represented by V.P. Bespalko who was engaged in the development of that technology and who outlined the main principles of training arrangement and identified the types of training programmes:

- linear programmes (consecutively changing small information units with test assignments);
- branching programmes (if the difficulty arises, more information is provided to the student to help him/her to do the test and give the correct answer);
- adaptive programmes (provide the learner with the opportunity to choose the difficulty level of the training material and to change it after it has been mastered);
- combined programmes (include fragments of previous programmes).

Computer-assisted training ensures actions acquisition under the strict requirements, according to V.N. Blednova et al. (Blednova et al., 2013), has several advantages:

- learning information capacity is increased;
- feedback is enhanced;
- every trainee works at his/her optimal pace;
- self-control and self-regulation skills are formed.

In sport programming is quite a strictly deterministic system of successive and acquired in practice operations and actions giving certain outcomes within the allotted time (Sakharova, 2004).

According to V.P. Filin and N.A. Fomina (Filin, Fomin, 1980), computer-assisted movement instruction involves such a teaching method, which reduces the unwanted effects of random exercise leading to the ultimate goal.

Compiling the learning process depends on the structural complexity of the actions trained, influenced by several factors (Bykov, 2012):

- a number of phases comprising an action;
- movement accuracy requirements in space and time;
- specifics of movement coordination in each action phase and in the action as a whole;
- simplicity and complexity of the rhythmic structure of the action.

When computer-assisted instruction is in place the mastery of next portion of knowledge and skills is examined after each step. This provides the possibility to adapt the pace of learning to the learner's individual characteristics. At the same time, it is necessary to clearly articulate learning goals and objectives for each class, each stage of the class, and ways of achieving them for some motor drills. In this way, the didactic principles of consciousness and activity are implemented (Bykov, 2012).

Computer-assisted instruction method used with training computer linear programmes is successfully applied for training practical skills in shooting and in the theoretical study of gunnery regulations followed by the practical study. The learner plunging into the atmosphere of the assignment falls into the conditions under which the instructor is technically facilitated to pay attention not only to the way the shooter on the whole performs the action, but also to analyze constantly the accuracy and speed of the action individual elements. Having identified the weaknesses and focusing on them, the instructor in this way contributes to learners' further skills development. This circumstance ensures not only automation of a skill as it takes place outside the computer-assisted instruction, but also working out the shooter's absolute proficiency, which in a quality manner differs from simple automaticity attained through higher productivity. At the same time, this productivity is the result of not only trainees' physical activity intensification but an increase in the proportion of creative mental operations (Aksenov, 2015).

However, it is not always possible to train complex movements through programmed training using a linear principle, since not every assignment can be divided into simple elements, which will not change the logical internal content of the assignment. This problem is solved while maintaining structural and biomechanical integrity of the exercise by means of branching programming. Provided by the programme, training errors and ways to correct them makes the learning process more effective and individualized than the linear method of learning material disposition (Sakharova, 2004).

For instance, in gymnastics they widely use the algorithm of linear-branching programming when training motor actions, both beginners and highly skilled athletes. Such programming provides for the distribution of the learning assignments when training motor actions into the basic and supplementary ones. The transition from one main task to the following one is possible only if the previous learning material has been well acquired. If there is a difficulty in performing the basic tasks there arises a possibility to perform supplementary assignments, and then doing the following main task is allowed (Pimakhin, Furmanov, 2014).

Training programmes compiled due to the complexity of technical actions acquisition in volleyball following the principle of linear-branching programming results in a better and faster skills development. Movement complexity in volleyball is conditioned by the playing technique composition consisting of two parts: an attack technique and a defense one. Each of these parts is subdivided into two subsections: relocation techniques and ball handling ones. Each subsection includes a number of techniques that are different from each other by the execution details. The training programme consists of a theoretical part and a practical one. The aim of the theoretical part is forming with the trainees a comprehensive and science-based knowledge of movement trained. First, a semantic meaning of the technique execution of the game technique accompanied by the record improving knowledge assimilation is given in a concise form. The process of drills learning in a programmed form takes place in the practical part. This facilitates to run effectively the learning process, taking into account the athlete's individual motor experience. In addition, training programmes form the skill to evaluate the movement in time and space, according to the degree of muscular effort, those programmes take into account the didactic requirements of learning (Pimakhin, Furmanov, 2014).

One of the approaches to develop the ideas of computer-assisted instruction, according to A.V. Bykov (Bykov, 2012), is using the principles of educational kinesiology, which increase the efficiency of the motor actions learning process and movements control in the course of a training session. This is achieved through high-level didactics (especially what concerns the principles of consciousness and performance), i.e. by means of focusing on self-learning or movements self-management.

Another approach to computer-assisted instruction is the technology of mastery learning (Kavera, 2013), proposed by the foreign authors: B. Bloom, J. Carroll, J. Block, L. Anderson. They hypothesised that the learner's abilities are found out mainly under the optimally selected for the certain individual conditions. Therefore, here an adaptive learning system that allows all the students to learn the programme material is required. Mastery learning technology sets the universal for all students mastery knowledge level, but at the same time makes for each learner the certain time, methods and forms of training variable. The main feature of this system is identifying the standard of mastery learning to be accomplished by all the learners. Mastery learning technology can be applied successfully at the beginner's stage of training technical actions to children and adolescents.

3. Conclusion

The technology of computer-assisted training of technical actions to children and adolescents will enhance the interest in the learning process, will optimise the training session structure and the training quality.

The training programmes compiled on the basis of linear-branching and adaptive programming, in our opinion, is the most effective way of training technical actions in team sports, where the toolkit of techniques and their combinations is almost unlimited. Such training contributes to start-up and improvement of technical skills, allows to effectively manage the learning process taking into account the learners' individual motor experience.

Литература

Аксенов, 2015 – *Аксенов К.В.* Применение компьютерных технологий обучения стрельбе из стрелкового оружия // Образовательные технологии и общество. 2015. № 1. С. 519-534.

Афоньшин и др., 2014 – *Афоньшин В.Е., Полевщиков М.М., Роженцов В.В.* Технология тренировки передач в спортивных играх // Ученые записки университета им. П.Ф. Лесгафта. 2014. № 1. С. 10-13. DOI: 10.5930/issn.1994-4683.2014.01.107.p10-13.

Афоньшин, 2015 – Патент РФ № 2014138070/12, 19.09.2014. *Афоньшин В.Е.* Способ тренировки технико-тактических действий спортсмена в игровых видах спорта // Патент России № 2557497. 2015. Бюл. № 20.

Бледнова и др., 2013 – *Бледнова В.Н., Трунин В.В., Кораблева Е.Н.* Интерактивные методы обучения в процессе преподавания дисциплины «Физическая культура» // Труды Санкт-Петербургского государственного университета культуры и искусств. 2013. Т. 200. С. 443-448.

Быков, 2012 – *Быков А.В.* Программированное обучение двигательным действиям в командных игровых видах спорта // Известия Пензенского государственного педагогического университета им. В.Г. Белинского. 2012. № 28. С. 707-710.

Кавера, 2013 – *Кавера В.А.* Современные педагогические технологии в системе дополнительного образования детей // Труды Санкт-Петербургского государственного университета культуры и искусств. 2013. Т. 195. С. 159-170.

Масло, 2010 – *Масло И.М.* Подвижные игры в системе подготовки спортсменов // Веснік Мазырскага дзяржаўнага педагагічнага ўніверсітэта імя І.П. Шамякіна. 2010. № 2(27). С. 72-75.

Пимахин, Фурманов, 2014 – *Пимахин Е.А., Фурманов А.Г.* Техника и методика программированного обучения юных волейболисток подаче мяча и нападающему удару // Веснік Мазырскага дзяржаўнага педагагічнага ўніверсітэта імя І.П Шамякіна. 2014. № 3(44). С. 71-78.

Плотников, 2012 – *Плотников В.В.* Технико-тактическая подготовка хоккеистов на этапе углубленной специализации // Омский научный вестник. 2012. № 5. С. 211-214.

Рами, 2011 – *Рами З.М.А.* Возрастная дифференцировка состава критериев отбора юных спортсменов к специализации в мини-футболе // Вестник Адыгейского государственного университета. Серия 3: Педагогика и психология. 2011. № 2. С. 232-236.

Роженцов, Афоньшин, 2013 – *Роженцов В.В., Афоньшин В.Е.* Тактическая подготовка в игровых видах спорта с использованием виртуальной реальности // Программные системы и вычислительные методы. 2013. № 3(4). С. 272-276. DOI: 10.7256/2305-6061.2013.3.8904.

Роженцов, Афоньшин, 2014 – *Роженцов В.В., Афоньшин В.Е.* Технология технико-тактической подготовки в игровых видах спорта // Кибернетика и программирование. 2014. № 3. С. 103-109. DOI: 10.7256/2306-4196.2014.3.12048.

Сахарова, 2004 – *Сахарова М.В.* Проектирование систем подготовки спортсменов (команды) в игровых видах спорта // Теория и практика физической культуры. 2004. № 5. С. 35–38.

Суворов, 2007 – *Суворов В.В.* Индивидуальные типологические показатели технико-тактических действий футболистов 12–15 лет // Ученые записки университета им. П.Ф. Лесгафта. 2007. № 6. С. 85-89.

Уман, 2012 – *Уман А.И.* Тенденции развития современной дидактики // Отечественная и зарубежная педагогика. 2012. № 5(8). С. 38-48.

Филин, Фомин, 1980 – *Филин В.П., Фомин Н.А.* Основы юношеского спорта. М.: Физкультура и спорт, 1980. 255 с.

Afonshin, Rozhentsov, 2016a – *Afonshin V.E., Rozhentsov V.V.* The Method of Team Sports Athletes' Motor Skills Development // European Journal of Physical Education and Sport. 2016. Vol. 12. Is. 2. pp. 34-40. DOI: 10.13187/ejpe.2016.12.34.

Afonshin, Rozhentsov, 2016b – Afonshin V.E., Rozhentsov V.V. The Technology to Train Techniques in Sports // European Journal of Physical Education and Sport. 2016. Vol. 11. Is. 1. pp. 4-9. DOI: 10.13187/ejpe.2016.11.4.

Polevshchikov et al., 2014 – *Polevshchikov M.M., Afonshin V.E., Rozhentsov V.V.* A Technology for Technical Preparation of Young Athletes in Team Sports // European Journal of Physical Education and Sport. 2014. V. 3. № 1. pp. 54-58. DOI: 10.13187/issn.2310-0133.

References

Aksenov, 2015 – *Aksenov K.V.* (2015). Primenenie komp'yuternykh tekhnologii obucheniya strel'be iz strelkovogo oruzhiya [The use of computer training technologies in shooting from small arms]. *Obrazovatel'nye tekhnologii i obshchestvo*. № 1. S. 519-534.

Afon'shin i dr., 2014 – *Afon'shin V.E., Polevshchikov M.M., Rozhentsov V.V.* (2014). Tekhnologiya trenirovki peredach v sportivnykh igrakh [The training technology of pass in sports games]. *Uchenye zapiski universiteta im. P.F. Lesgafta*. № 1. S. 10-13. DOI: 10.5930/issn.1994-4683.2014.01.107. p. 10-13.

Afon'shin, 2015 – Patent RF № 2014138070/12, 19.09.2014. Afon'shin V.E. Sposob trenirovki tekhniko-takticheskikh deistvii sportsmena v igrovykh vidakh sporta [The way of training of technical and tactical actions of athletes in playing sports]. Patent Rossii № 2557497. 2015. Byul. № 20.

Blednova i dr., 2013 – *Blednova V.N., Trunin V.V., Korableva E.N.* (2013). Interaktivnye metody obucheniya v protsesse prepodavaniya distsipliny «Fizicheskaya kul'tura» [The interactive training methods in the teaching of discipline "The physical culture"]. *Trudy Sankt-Peterburgskogo gosudarstvennogo universiteta kul'tury i iskusstv*. T. 200. S. 443-448.

Bykov, 2012 – *Bykov A.V.* (2012). Programmirovannoe obuchenie dvigatel'nym deistviyam v komandnykh igrovykh vidakh sporta [The programmed learning of motor actions in a team playing sports]. *Izvestiya Penzenskogo gosudarstvennogo pedagogicheskogo universiteta im. V.G. Belinskogo*. № 28. S. 707-710.

Kavera, 2013 – *Kavera V.A.* (2013). Sovremennye pedagogicheskie tekhnologii v sisteme dopolnitel'nogo obrazovaniya detei [The contemporary educational technologies in the system of additional children education]. *Trudy Sankt-Peterburgskogo gosudarstvennogo universiteta kul'tury i iskusstv*. T. 195. S. 159-170.

Maslo, 2010 – *Maslo I.M.* (2010). Podvizhnye igry v sisteme podgotovki sportsmenov [The motion games in the system of preparation of athletes]. V*esnik Mazyrskaga dzyarzhaўnaga pedagagichnaga ўniversiteta imya I.P. Shamyakina*. № 2(27). S. 72-75.

Pimakhin, Furmanov, 2014 – *Pimakhin E.A., Furmanov A.G.* (2014). Tekhnika i metodika programmirovannogo obucheniya yunykh voleibolistok podache myacha i napadayushchemu udaru [The technique and methodology of the programmed training of young volleyball players of the ball feed and striker blow]. *Vesnik Mazyrskaga dzyarzhaўnaga pedagagichnaga ўniversiteta imya I.P Shamyakina*. № 3(44). S. 71-78.

Plotnikov, 2012 – *Plotnikov V.V.* (2012). Tekhniko-takticheskaya podgotovka khokkeistov na etape uglublennoi spetsializatsii [The technical-tactical training of hockey players at the stage of advanced specialization]. *Omskii nauchnyi vestnik*. № 5. S. 211-214.

Rami, 2011 – *Rami Z.M.A.* (2011). Vozrastnaya differentsirovka sostava kriteriev otbora yunykh sportsmenov k spetsializatsii v mini-futbole [The age differentiation of criteria structure for selection of young sportsmen to specialization in minifootball]. *Vestnik Adygeiskogo gosudarstvennogo universiteta. Seriya 3: Pedagogika i psikhologiya*. № 2. S. 232-236.

Rozhentsov, Afon'shin, 2013 – *Rozhentsov V.V., Afon'shin V.E.* (2013). Takticheskaya podgotovka v igrovykh vidakh sporta s ispol'zovaniem virtual'noi real'nosti [The tactical training in team sports with the use of virtual reality]. *Programmnye sistemy i vychislitel'nye metody*. № 3(4). S. 272-276. DOI: 10.7256/2305-6061.2013.3.8904.

Rozhentsov, Afon'shin, 2014 – *Rozhentsov V.V., Afon'shin V.E.* (2014). Tekhnologiya tekhniko-takticheskoi podgotovki v igrovykh vidakh sporta [The technology of technical and tactical training in team sports]. *Kibernetika i programmirovanie*. № 3. S. 103-109. DOI: 10.7256/2306-4196.2014.3.12048.

Sakharova, 2004 – *Sakharova M.V.* (2004). Proektirovanie sistem podgotovki sportsmenov (komandy) v igrovykh vidakh sporta [The designing of training systems of athletes (team) in playing sports]. *Teoriya i praktika fizicheskoi kul'tury*. № 5. S. 35–38.

Suvorov, 2007 – *Suvorov V.V.* (2007). Individual'nye tipologicheskie pokazateli tekhniko-takticheskikh deistvii futbolistov 12–15 let [The individual typological indicators of technical and tactical actions of football players of 12-15 years]. *Uchenye zapiski universiteta im. P.F. Lesgafta*. № 6. S. 85-89.

Uman, 2012 – *Uman A.I.* (2012). Tendentsii razvitiya sovremennoi didaktiki [The development tendencies of modern didactics]. *Otechestvennaya i zarubezhnaya pedagogika*. № 5(8). S. 38-48.

Filin, Fomin, 1980 – *Filin V.P., Fomin N.A.* (1980). Osnovy yunosheskogo sporta [The fundamentals of youth sports]. M.: Fizkul'tura i sport, 255 s.

Afonshin, Rozhentsov, 2016a – *Afonshin V.E., Rozhentsov V.V.* (2016). The Method of Team Sports Athletes' Motor Skills Development. *European Journal of Physical Education and Sport*. Vol. 12. Is. 2. pp. 34-40. DOI: 10.13187/ejpe.2016.12.34.

Afonshin, Rozhentsov, 2016b – *Afonshin V.E., Rozhentsov V.V.* (2016). The Technology to Train Techniques in Sports. *European Journal of Physical Education and Sport*. Vol. 11. Is. 1. pp. 4-9. DOI: 10.13187/ejpe.2016.11.4.

Polevshchikov et al., 2014 – Polevshchikov M.M., Afonshin V.E., Rozhentsov V.V. (2014). A Technology for Technical Preparation of Young Athletes in Team Sports. *European Journal of Physical Education and Sport*. V. 3. № 1. pp. 54-58. DOI: 10.13187/issn.2310-0133.