STRENGTH MAINTENANCE TRAINING IN THE REHABILITATION OF COMMON INJURIES IN SOCCER ATHLETES DURING THE WINTER

TREINAMENTO DE MANUTENÇÃO DE FORÇA NA REABILITAÇÃO DE LESÕES COMUNS EM ATLETAS DO FUTEBOL DURANTE O INVERNO

ENTRENAMIENTO DE MANUTENCIÓN DE FUERZA EN LA REHABILITACIÓN DE LESIONES COMUNES EN ATLETAS DE FÚTBOL DURANTE EL INVIERNO

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ABSTRACT

Introduction: The level of soccer athletics develops rapidly, requiring athletes to be more capable of training, strengthening, and competitive readiness. Often, these characteristics are compromised by preventable injuries resulting from excessive or unreasonable training, especially in winter. The outcome is the athlete's absence from games during the season, compromising the team's qualification. Objective: Improve the treatment and prevention of the major injuries caused to soccer athletes in winter. Methodology: The main injuries resulting from poor training and the best practices of awareness and recovery were researched. The selected actions were implemented on ten athletes with follow-up during the entire annual season, totaling 50 games. Results: An increase in the number of active athletes during the competition phase was observed in 7 games, and competition efficiency was increased by 14%. Conclusion: Soccer players can get better rehabilitation through practical strength maintenance training in the rehabilitation phase between winter training and competitions. This scientific and rational method has a significantly positive effect on the physical performance of athletes. ***Evidence Level II; Therapeutic Studies – Investigating the results.***

Keywords: Soccer; Rehabilitation; Resistance Training.

RESUMO

Introdução: O nível do atletismo do futebol desenvolve-se rapidamente, exigindo que os atletas sejam mais capazes de treinar, fortalecerem-se e prepararem-se para a competição. Muitas vezes, essas características são comprometidas por lesões evitáveis resultantes de treinamento excessivo ou irracional, especialmente no inverno. O resultado é a ausência do atleta nos jogos durante a temporada, comprometendo a qualificação da equipe. Objetivo: Melhorar o tratamento e a prevenção das maiores lesões ocasionadas aos atletas de futebol durante o inverno. Metodologia: As principais lesões resultantes do mau treinamento e as melhores práticas de conscientização e recuperação foram pesquisadas. As ações selecionadas foram implementadas em dez atletas com acompanhamento durante toda a temporada anual, totalizando 50 jogos. Resultados: Um aumento no número de atletas ativos durante a fase de competição foi observado em 7 jogos, e a eficiência da competição foi aumentada em 14%. Conclusão: Os jogadores de futebol podem obter melhor reabilitação através de treinamento prático de manutenção de força na fase de reabilitação entre o treinamento de inverno e as competições. Esse método científico e racional tem um efeito significativamente positivo sobre o desempenho físico dos atletas. ***Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

Descritores: *Futebol; Reabilitação; Treinamento de Força.*

RESUMEN

Introducción: El nivel del atletismo de fútbol se desarrolla rápidamente, lo que exige de los atletas una mayor capacidad de entrenamiento, fortalecimiento y preparación para la competición. Con frecuencia, estas características se ven comprometidas por lesiones evitables derivadas de un entrenamiento excesivo o no adecuado, en particular durante el invierno. El resultado es la no participación del atleta en los partidos de la temporada, lo que compromete la clasificación del equipo. Objetivo: Mejorar el tratamiento y la prevención de las principales lesiones causadas a los deportistas de fútbol en el invierno. Metodología: Se investigaron las principales lesiones derivadas de un mal entrenamiento y las mejores prácticas de sensibilización y recuperación. Las acciones seleccionadas se aplicaron en diez atletas con seguimiento durante toda la temporada anual, con un total de 50 partidos. Resultados: Se observó un aumento del número de atletas activos durante la fase de competición en 7 partidos, y la eficacia de la competición se incrementó en un 14%. Conclusión: Los futbolistas pueden conseguir una mejor rehabilitación mediante un entrenamiento práctico de mantenimiento de la fuerza en la fase de rehabilitación entre el entrenamiento invernal y las competiciones. Este método científico y racional tiene un efecto significativamente positivo en el rendimiento físico de los atletas. ***Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

Descriptores: *Fútbol; Rehabilitación; Entrenamiento de Fuerza.*

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INTRODUCTION

Football is the most important sport in the world, which has always existed with the title of "the first movement in the world". A football match between a strong team and another one is enough to attract hundreds of millions of spectators and football is an integral part of our lives.[1] Football is a vigorous physical activity, during the exercise, the body is often damaged, and the occurrence of various injuries is closely linked with the competitive activities. At present, the level of football athletics is developing rapidly, which requires football players to increase their training capacity, keep exercising themselves, strengthen themselves and keep themselves in a better competitive standard, but usually excessive training and unreasonable training will bring serious negative problems. What's more, nowadays Chinese athletes lack the concept of maintenance strength training, thus the injuries of athletes on the football field and after the field have always been a problem. No matter who a player is, once the injury comes, the team's competition will be affected.[2] The athletes are required to have more energy and training.[3,4] At this stage, the level of football in China is inferior to that of many other teams in foreign countries, which not only needs to improve football skills, but also focuses on physical training.[5] Our country lacks concrete and excellent football training methods, football players also lack some practical preventive measures during the training so that they can't prevent injuries well.[6] When athletes encounter injuries, most of athletes' injuries have not been given enough attention, which has seriously affected the development of football in our country.[7] A scientific training program is need, and only a scientific training program can achieve twice the result of half the effort.[8] At the same time, only in an orderly and step-by-step development, our country can have more outstanding talents in the field of football. Only by selecting the outstanding talents, all kinds of good players can be available to lay a solid foundation for the success of the international competition in the future. Chinese football players have not reached a high level of training in their physical fitness for a long time, and problems have mainly arisen in the methods of strength training.[9] Therefore, the change from purely irregular physical training to maintenance strength training has epoch-making significance for football players.[10] This is not only important for both professional soccer players and the majority of Chinese teenagers and children.[11]

Related research on maintenance strength training of damaged parts of football players

Current situation of sports injuries of football players in winter

There are many injuries in the sports in winter. By browsing a lot of information, the injury of professional football players in the surrounding countries was investigated and the statistics of the data were carried out. After the injury of parts of body, the athletes are not treated well, the burden of the players is aggravated, and the injuries appear gradually, which lead to many injured players. However, there is sudden decrease in injury and disease after maintenance strength training. At this stage, the attack and defense system of football is more comprehensive, and the cooperation between players is more closely. There are many injuries that footballers may have in winter, including the injuries of knee, ankle and hip joints.[12,13] When football players do not have long-term and effective physical training, usually their mental, tactile and physical problems will occur, thus resulting in frequent mistakes in their action. Now, the coaches, doctors and rehabiliters of many teams are working together to conduct targeted studies of each individual and find the best way to practice physical fitness, because physical fitness is the core of the ability of the game and directly determines the victory of the game, it can be used as an important part of the evaluation of the comprehensive ability of football players.[14] As the style and emphasis of the competition change, the requirements for the players will also be changed accordingly, which requires the players' physical fitness training should keep pace with the times to better meet the requirements of the development of the times.[15] As we all know, modern football has gained considerable development, it relies more on skill, speed and endurance, so that in this way, players can better carry out the skills and tactics set by coaches. Before the execution of action, strength is the basic premise for completing actions, and training is the necessary guarantee for completing actions.[16]

Related theory of maintenance strength training

Football is very demanding for the strength of an athlete. According to different players and different characteristics, the corresponding training methods are adopted, so as to train the strength and vitality as well as a stronger willpower of athletes in the game.[17] Training needs to follow the principle of periodicity, gradualism and systematicness. Periodicity refers mainly to repeated training, and the training is structured to gradually increase the athlete's ability on the field.[18] At the same time, footballers should follow the principle of gradual progress; they are required to be warm-up before training. Warm-up involves a variety of preparation activities, and starts with the training of the legs to the shoulder and then to the waist.[19] Systematic training can make football players maintain a high level of athleticism, so an athlete's career is accompanied by the systematic training from the beginning to the end, the strength of athletes is gradually strengthened and maintained through long-term training, and long-term and reasonable training is important to avoid the physical pain associated with unscientific training.[20]

Research on investigation and treatment of damaged parts

The harm of common muscle damage

It is unavoidable that the footballers get injured in the body during exercise. Some serious problems have been found in some investigations and studies. The proportion of football players with injuries in training actually reaches 100%, which also explains in another way that football is a sport that is exhausting and easy to cause hurt with collision and scramble. It is very important for the athletes to carry out maintenance strength training on the damaged parts, which is the most crucial part of training. There are mainly the reasons for the injury of footballers such as relatively intensive training, unreasonable use of tactics, poor protection before pre-match and pre-training, lack of adequate preparation before training, and lack of the way of training varying from person to person, unscientific methods and so on. The number and probability of people in various situations are shown in Table 1.

In football sport, injury and illness are accompanied by competitions, the game is accompanied by injuries and diseases, the surveyed report shows the terrible condition of 100% injury and diseases, which require the attention to the maintenance training of the players, and the impact of every injury on the players should not be underestimated. Common muscle damage is shown in Figure 1.

With the continuous development of medical technology in Asia, conservation therapy has been effective at the beginning. At the same time, this paper made a questionnaire survey of football players after a football match, and football players' vulnerable parts and the probability of each damaged part were known comprehensively. (Table 2)

Table 1. Reasons of sport injuries of football players.

Reasons	Number of people	Percentage%
Strength training	35	35%
Unscientific training	30	30%
Incorrect of the use of technology	10	10%
Inadequate preparation	12	12%
Lack of ego to protect consciousness	8	8%
Field gear	5	5%

Table 2 shows that the probability of injury occurred in the lower part of the body of footballers is generally higher than the upper part of the body, the probability there is a significant difference in the incidence between the upper and lower limbs, this is not caused by an occasional factor but an inevitable result of the characteristics of the football game. Since in the course of football, the lower limbs of the players tend to feel a strong counterforce, the player usually requires the body to make corresponding actions because of certain actions at some moment in the game; some of these are the incidental inertia of making these corresponding actions. Strength training requires not only the training of the head muscle, but also the strength of other muscles, otherwise, the knee joint will be unstable. The ankle is also important, which is important in the intense training process that often causes sprains and bruises. The composition of the muscle system is shown in Figure 2.

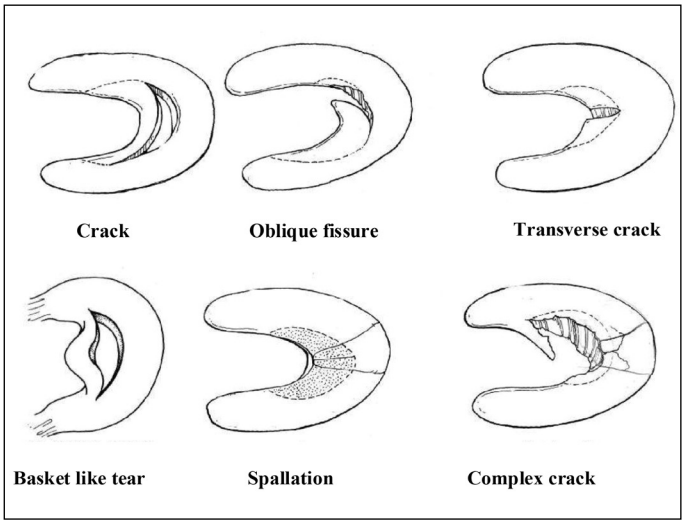

Figure 1. Common muscle damage map.

Table 2. Probability of sport injuries of football players.

	Head	Arm	Thorax	Thigh	Shank	Ankle	Knee	Other
Number of injury	10	13	9	8	5	40	55	10
Percentage	6.7%	8.7%	6%	5.3%	3.3%	26.7%	36.7%	6.7%

Study on the curing treatment of damaged parts

After being subjected to various kinds of injuries, in order to recover the injured parts as soon as possible, the footballer needs to adjust his or her attitude and take the initiative to receive treatment. After the muscle is injured, the maintenance strength training is required, the amount of corresponding training can't be increased, otherwise, the muscle tearing will occur. At this time, the muscles of the body become very painful, thus causing the injured part to enter the dormant state for the time being. A muscle tear can produce a severe hematoma, and the corresponding depression appearing under the skin can be observed by the eye. Usually in a day of muscle tear, it is necessary to carry out a massage treatment or to carry out the necessary ultrasonic physiotherapy. After about three or four days, the injured football players do a small amount of simple training. After a week, the athlete can do the proper jogging, and if the body feels no pain, the training accordingly can be started. The maintenance strength training for injured players is usually shown in Figure 3.

When players compete with fierce competition in the football arena, the bones associated with the joints of the body are subjected to violent shocks, which can distort the body parts, and the players with unserious situation can recover quickly, while serious patients need great care. When a football player is dislocated, it is necessary to avoid additional pressure and control the area of the injured part as far as possible. The

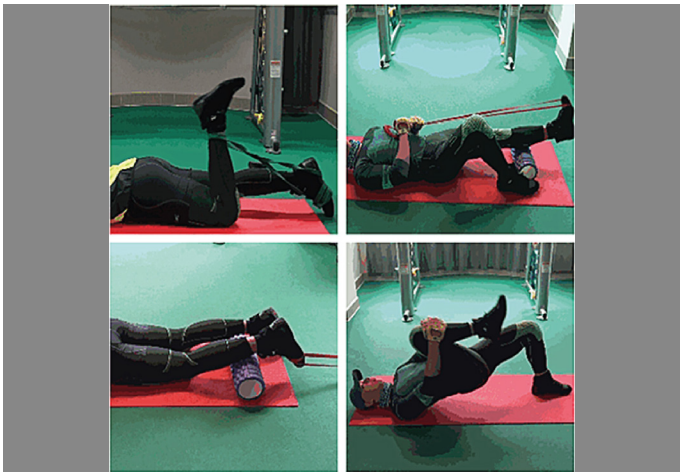

Figure 3. Maintenance training from football players.

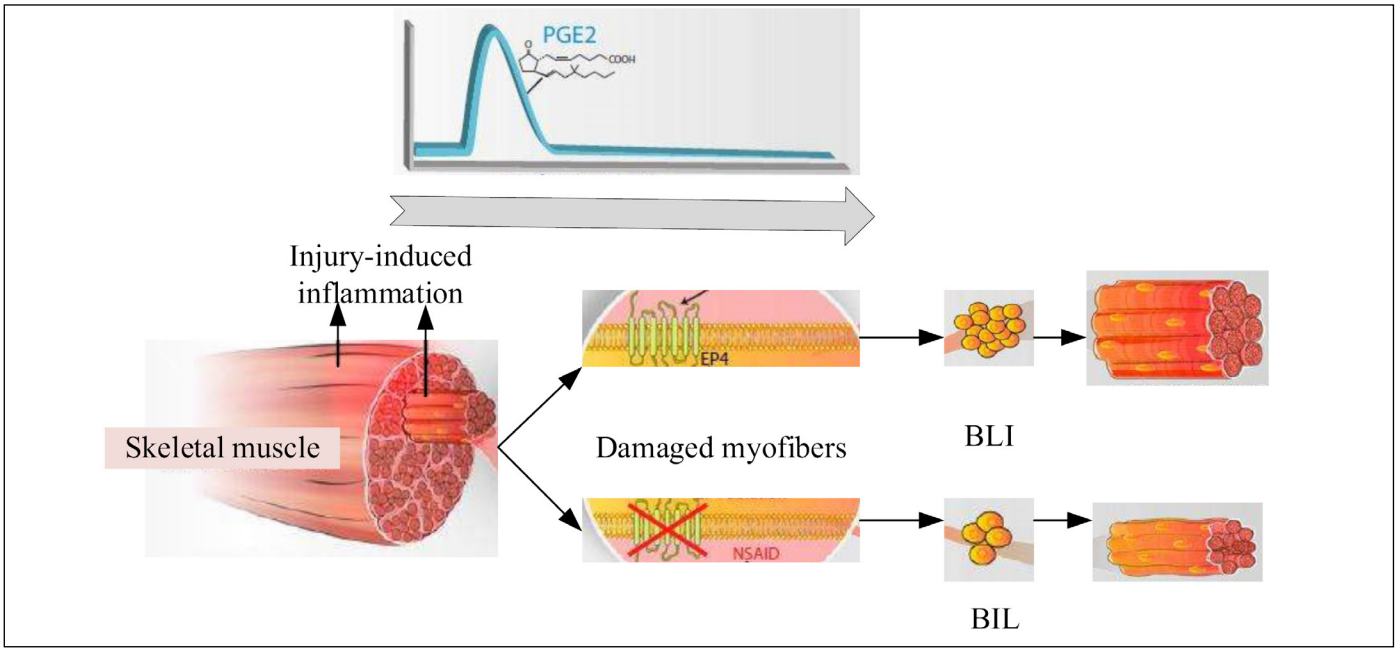

Figure 2. Composition of the muscle system.

players who are dislocated must keep supine and avoid internal surplus blood. Ice compress is required for the injured part, artificially massaging the dislocated parts is also necessary to relieve the deterioration of the muscle tissue, and then the corresponding physical therapy is carried out to treat the injury and slowly try to restore the exercise.

Concrete implementation of maintenance training

Some football players were used as the objects of research. After comparing their maintenance training with those without maintenance training, the benefits of maintenance were analyzed. The flow chart of comparison is shown in Figure 4.

The calculation expression about the average number of fields in the competition of the football players investigated who take part in match before the training of the maintenance strength training is as follows:

$$\overline{m} = (m_1 + m_2 + \cdots + m_n)/n \quad (1)$$

n - is the number of football players surveyed and m is the number of fields in the competition of players surveyed. The expression of the average efficiency of the competition before the training of the maintenance strength is:

$$\eta = \frac{\overline{m}}{H} \quad (2)$$

H- is total number of fields in the competition of footballers for a year who have been investigated. The calculation expression about the average number of fields in the competition of the football players investigated who take part in match after the training of the maintenance strength training is as follows:

$$\overline{m_1} = (m_1^{'} + m_2^{'} + \cdots + m_n^{'})/n \quad (3)$$

m_1 is the number of fields in the competition of players surveyed.

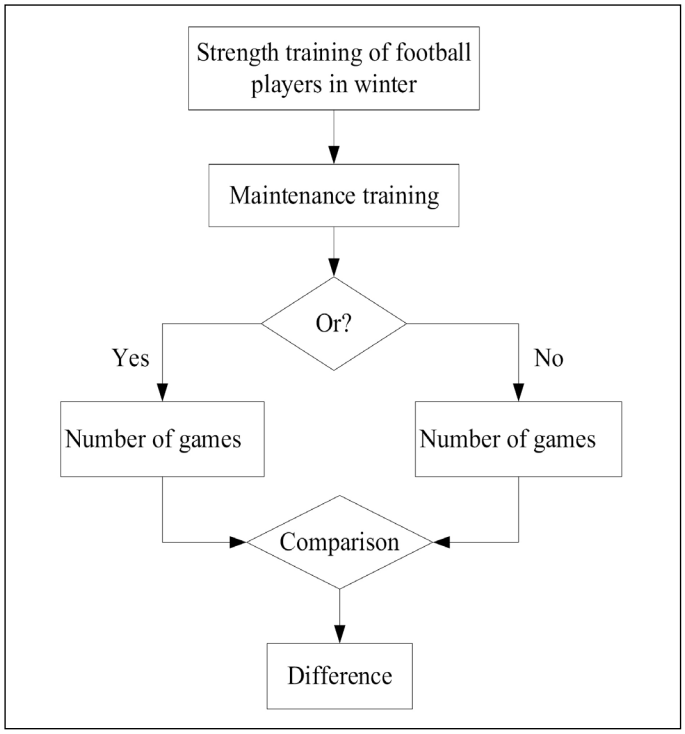

Figure 4. Comparison of before and after maintenance training.

The calculation expression of the average efficiency of the competition before the training of the maintenance strength is:

$$\eta_1 = \frac{\overline{m_1}}{H} \quad (4)$$

After carrying out the training of maintenance strength, the average number of football players who participate in the game on every year is increased as formula (5), and the efficiency is increased as formula (6).

$$\overline{m_0} = \overline{m} - \overline{m_1} = \frac{\sum_1^n m - \sum_1^n m_1}{n} \quad (5)$$

$$\eta_0 = \eta_1 - \eta = \frac{\overline{m_1}}{H} - \frac{\overline{m}}{H} \quad (6)$$

The objects of research were some football players who were a surveyed randomly, the number of the surveyed was 10, and there were fifty 50 foot ball games at a year. Previous training methods were used to train and repair body functions of injured football players. Generally, the number of games when players were able to enter the court and take part in match with their own team in one year is shown in Table 3, and the fluctuation of the number of games is shown in Figure 5.

It can be seen from Table 3 that the calculation expression of the annual average number of games of football players by using the previous training method is as follows:

$$\overline{m} = (m_1 + m_2 + \cdots + m_{10})/10 \quad (7)$$

The calculation expression of the average efficiency on entering and taking part in competition before the training of the maintenance force is:

$$\eta = \frac{\overline{m}}{50} \quad (8)$$

Experimental verification

In order to verify whether the proposed scheme is valid, the experimental verification was used; the injured football players were well restored through maintenance strength training. Because of more reasonable and scientific rehabilitation of football player, their body

Table 3. Number of participating games before maintenance.

Investigators	1	2	3	4	5	6	7	8	9	10
Number of games	44	34	41	35	42	36	34	43	34	40

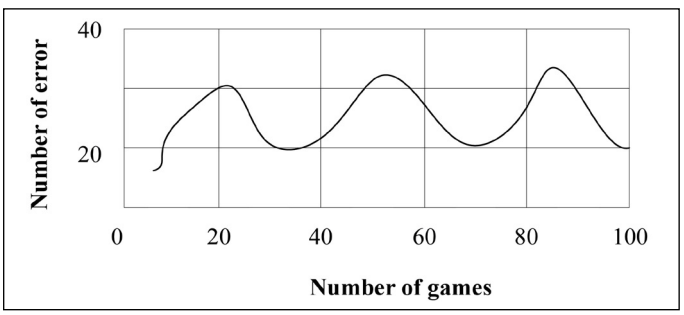

Figure 5. The number of participating games before maintenance.

function was better adjusted, the athlete's condition also became very good. In the corresponding football match, the attendance rate of football players had been greatly improved. The following are ten different footballers, generally, the number of games when players are able to enter the court and take part in match with their own team in one year is shown in Table 4, and the fluctuation of the number of games is shown in Figure 6.

It can be seen from Table 4 that by using scientific training methods, the calculating expressions of the annual average number of games of football players are as follows:

$$\overline{m_1} = (m_1^{'} + m_2^{'} + \cdots + m_{10}^{'})/10 \quad (9)$$

The calculation expression of the average efficiency on entering and taking part in competition after the training of the maintenance force is:

$$\eta_1 = \frac{\overline{m_1}}{50} \quad (10)$$

Table 4. Number of participating games before maintenance.

Investigators	1	2	3	4	5	6	7	8	9	10
Number of games	41	49	44	48	41	42	50	42	49	44

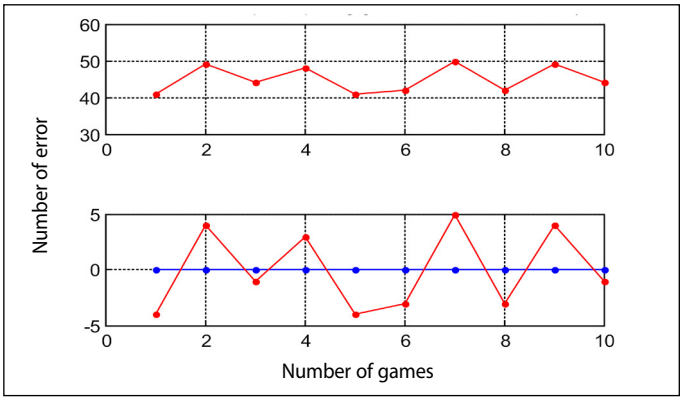

Figure 6. Figure of the number of participating games after maintenance.

After carrying out the training of maintenance strength, the average number of football players who participate in the game on every year is increased as formula (11), and the efficiency is increased as formula (12).

$$\overline{m_0} = \overline{m} - \overline{m_1} = \frac{\sum_1^n m - \sum_1^n m_1}{n} = 7 \quad (11)$$

$$\eta_0 = \eta_1 - \eta = \frac{\overline{m_1}}{H} - \frac{\overline{m}}{H} = 14\% \quad (12)$$

The football players can get better rehabilitation through effective maintenance strength training for the football players injured in winter training and competition. On average, the number of players in the competition is increased by 7 games, and the efficiency of the competition is increased by 14%. This scientific and rational method has brought a significant effect.

CONCLUSIONS

With the development of science and technology, many football matches are usually spread widely through various media, which makes that football becomes more concerned and valued. Football has gradually become an integral part of people's daily life. Although our country's football can't compare with many teams abroad, working hard and learning advanced playing methods of foreign countries have been strived for. Strength training is an integral part of training of football player. In winter, football players who practice strength training often suffer injuries because they need to withstand high-intensity scraping. The maintenance strength training for the injured part is helpful to the rapid recovery of the injuries of the football players, so as to better extend the football player's sports career and establish the correct means of protection. The maintenance strength training occupies an important role in the footballer's career. Regardless of which country and what kind of gender, the football players need to carry out reasonable strength training, only the scientific maintenance strength training can lay a solid foundation for the further development of players.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: Each author made a significant contribution to the manuscript YL: concept and design of the work. YY: acquisition, analysis, critical review of its knowledge content. YH: manuscript drafted and writing.

REFERENCES

1. Mohr M, Draganidis D, Chatzinikolaou A, Barbero-Álvarez JC, Castagna C, Douroudos I et al. Muscle damage, inflammatory, immune and performance responses to three football games in 1 week in competitive male players. European Journal of Applied Physiology. 2016;116(1):179-93.
2. Hrusch CL, Tjota MY, Sperling AI. The role of dendritic cells and monocytes in the maintenance and loss of respiratory tolerance. Current Allergy & Asthma Reports. 2015;15(1):494-9.
3. Engh MH, Settler F, Agergaard S. 'The ball and the rhythm in her blood: Racialised imaginaries and football migration from Nigeria to Scandinavia. Ethnicities. 2016;17(1):66-84.
4. Kh HM, Koutchouk SM, Mime M, Zerf M, Fateh Z. Which training improves the ability to control and manipulate the ball within the goalkeeper in football?. Journal of Physical Education & Sport. 2016;1(4):58-62.
5. Gil-Rey E, Lezaun A, Los Arcos A. Quantification of the perceived training load and its relationship with changes in physical fitness performance in junior soccer players. Journal of Sports Sciences. 2015;33(20):2125-32.
6. Koch M, Zellner J, Berner A, Grechenig S, Krutsch V, Nerlich M et al. Influence of preparation and football skill level on injury incidence during an amateur football tournament. Arch Orthop Trauma Surg. 2016;136(3):353-60.
7. Junge A, Dvořák J. Football injuries during the 2014 FIFA World Cup. British Journal of Sports Medicine. 2015;49(9):599-602.
8. Gilson TA. Psychology of Training Football Players. Strength & Conditioning Journal. 2015;37(6):102-8.
9. Liu J, Theory and Practice of Chinese Youth Football Training: An Empirical Study on Hengda Football School. Journal of Capital University of Physical Education & Sports, 2017, issue 5 , pages 399-403.
10. Kim JW, Kim J, Park S, Oh TK. Integrating embedded piezoelectric sensors with continuous wavelet transforms for real-time concrete curing strength monitoring. Structure & Infrastructure Engineering. 2015;11(7):897-903.
11. Remus D. Study on the content of sports training young football players 17-18 years, in private sports clubs. Timisoara Physical Education & Rehabilitation Journal. 2015;7(14):51-4.
12. Rahnemai-Azar AA, Yaseen Z, Van Eck CF, Irrgang JJ, Fu FH, Musahl V. Increased Lateral Tibial Plateau Slope Predisposes Male College Football Players to Anterior Cruciate Ligament Injury. Journal of Bone & Joint Surgery American Volume. 2016;98(12):1001-6.
13. Jacob R Joseph, Siri S Khalsa, Brandon W Smith, Paul Park. Impact of Increased Football Field Width on Player High-Speed Collision Rate. World Neurosurgery. 2017; Jul. 103:73-77. 10.1016/j.wneu.2017.03.106. Epub 2017 Apr 2. PMID: 28377252.
14. Manescu Claudiu. The Role of Plyometric Exercises in the Physical Preparation of Junior Female Football Players. Procedia - Social and Behavioral Sciences. 2015; vol. 180, pages 1257-1262. 10.1016/j.sbspro.2015.02.261.
15. Sautov RT, Abildabekov SA, Zaurenbekov BZ, Shankulov Y. Methodology of Increasing the Efficiency of Game Activity of Football Players of the Top Skills. Procedia - Social and Behavioral Sciences. 2015 volume; 190, pages : 207-10. 10.1016/j.sbspro.2015.04.936.
16. Smith L, Ruediger T, Alsalaheen B, Bean R. Performance of high school football players on clinical measures of deep cervical flexor endurance and cervical active range of motion: is history of concussion a factor?. Int J Sports Phys Ther. 2016;11(2):156-63.
17. Sautov RT, Abildabekov SA, Zaurenbekov BZ, Shankulov Y. Methodology of Increasing the Efficiency of Game Activity of Football Players of the Top Skills. Procedia - Social and Behavioral Sciences. 2015;190:207-10.
18. Skey M. 'What nationality he is doesn't matter a damn!' International football, mediated identities and conditional cosmopolitanism. National Identities. 2015;17(3):1-17.
19. Richardson AM. Nonparametric Statistics: A Step-by-Step Approach. International Statistical Review. 2015;83(1):163-4.
20. Porter T, Rushton A. The efficacy of exercise in preventing injury in adult male football: a systematic review of randomised controlled trials. Sports Medicine – Open. 2015;1(1):4.