



MYOFASCIAL RELEASE AS A MEANS OF INJURY PREVENTION AND MOVEMENT AMPLITUDE RECOVERY IN QUALIFIED FOOTBALL PLAYERS

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Abstract

The purpose of the study was to determine the effectiveness of MFR tools used in the training process of qualified football players.

Materials and methods. The study participants were 28 football specialists of the Ukrainian Premier League football teams and 36 football players of FC "Zorya" (Luhansk). Methods used in the study included analysis, generalization and systematization of data from scientific and methodical literature and Internet, questionnaire survey, pedagogical observations, pedagogical testing of flexibility indicators, pedagogical experiment, methods of mathematical statistics.

Results. The results of using MFR manual techniques in the training process of qualified football players are as follows: relaxation of chronically tense muscles, recovery of mobility and normal amplitude of motion in the joints, improvement of the elastic properties of the muscular and ligamentous structures of the musculoskeletal system of football players, optimization of hemodynamics and lymphodynamics at the microcirculatory level, optimization of general and local metabolic processes in the body, functional recovery of the musculoskeletal system of football players after excessive physical exertion and injuries, improvement of proprioception and neuromuscular control, optimization of the psychoemotional state.

Conclusions. The analysis of the results of testing the flexibility of football players of FC "Zorya" (Luhansk) at the end of the first and second preparatory periods of the 2019-2020 sports season allows us to state the presence of higher indicators compared to the results of preliminary testing in the 2018-2019 sports season. According to the results of the monitoring performed by the specialists of the complex scientific group, there has been recorded an 11.11% decrease in the number of injuries related to damage to the muscular-ligamentous structures of the lower limbs and trunk of football players in FC "Zorya" (Luhansk).

Keywords: MFR tools, prevention, injuries, amplitude of motion, football.

Introduction

In the vast majority of modern professional sports, coaches quite often encounter complaints from athletes about pain in the muscles, which is a sign of physical discomfort

and prevents athletes from fully training and competing. However, in the majority of cases, medical professionals do not diagnose problems related to the functioning of the musculoskeletal system of athletes (Bethers et al., 2021; Al Attar et al., 2021; Al Attar, 2021). On the other hand, the coach visually records certain movement defects when performing football techniques and sportsmen's posture, which leads to a decrease in the effectiveness of the training process of

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qualified football players. This situation leads to the loss of a significant amount of competitive and training time due to the need for restorative treatment and rehabilitation (Riepenhof et al., 2018; Al Attar et al., 2022).

The probable cause of such problems is negative changes in the myofascial structures of the locomotor apparatus in qualified football players, which are characterized by the donozological or pre-morbid conditions of their bodies. The development of pre-pathological conditions is a complex consequence of maximal and submaximal physical exertion, injuries of the musculoskeletal system, and the effects of permanent stress factors. As a result, the myofascial structures of the body in qualified football players partially lose elasticity. As a result of the cumulative effect of the mentioned factors, microtraumas, and minor damage to the muscle-ligamentous structures, there is a limitation of the amplitude of movements in the joints, and the development of the adhesion process with subsequent pathological and pathomorphic phenomena based on the formation of scars of the muscle-fascial structures (Barbero et al., 2019; Baumler et al., 2023).

In connection with the above, attention should be paid to the use of the term “trigger point” in modern research by authorship of Janet G. Travell (Barbero et al., 2019). The concept of myofascial pain syndrome was initiated in her works. According to her definition, given in the study (Shah et al., 2015), myofascial pain syndrome is pain and (or) autonomic symptoms (the focus of muscle hyperexcitability) that are reflected from active myofascial trigger points with a certain manifestation of dysfunction (Fig. 1).

In addition, the symptom complex of stress agents affects the hyperreactive nervous structure of the myofascial trigger point, which leads to increased activity (A-B), and transfer of sensations (pain, paresthesia, increased sympathetic activity) to the location (C-D). Other stimuli reach the spinal cord from distant trigger points and additional dysfunctional locations (E-F) (Musculoskeletal Key).

According to the authors of the research, the trigger point is defined as a location of tissue hyperreactivity with a diameter of several millimeters, which is painful when squeezed. These points, which feel like peas in the muscle tissue, shorten the muscle fibers of which they are a part (Riepenhof et al., 2018; Ricci et al., 2023).

Researchers note that indicators of microcirculatory hemodynamics in the area adjacent to the trigger point significantly decrease. This leads to oxygen deficiency and the accumulation of metabolic products, which further irritate the trigger point and provoke the appearance of pain signals (Kisilewicz et al., 2018). Meanwhile, due to the mechanical compression of one segment of the muscle fiber, its other segments are in a state of stretching. As a result, the muscle fiber partially loses its elastic properties, which negatively affects the amplitude of motor activity. Irritated trigger points prevent muscles from relaxing, as a result, there is increased fatigue, a decrease in the functions of intermuscular coordination, and an increased recovery time (Das & Jhajharia, 2022). In the absence of correction, myofascial trigger points deprive the muscle tissue of elasticity so that the normal physiological tone of the fascial chains changes – this is extrapolated to other muscles, which significantly limits the mobility of adjacent joints (Das et al., 2022).

In order to solve this problematic situation, it is necessary to find the most effective means and methods that allow to restore the lost functions of muscle and ligament structures in the shortest possible time (Cao et al., 2021). This is relevant both for sports in general (Sofyan et al., 2022), and for football in particular. One of these methods is MFR, which researchers define as a simultaneous manual effect on muscle and connective tissue aimed at relaxing myofascial structures (Baumler et al., 2023). The effect is achieved due to compression and passive stretching of irritated musculofascial structures, which require restorative therapy and rehabilitation (Manzi et al., 2020; Bethers et al., 2021).

It is believed that MFR tools in combination with stretching are effective exercises for accelerating recovery processes after significant physical exertion, reducing pain sensations and muscle hypertonicity, increasing the flexibility of the joints, and reducing the probability of injury of the athletes (Doroshenko, 2015; Doroshenko et al., 2019).

Most often, a special cylinder (Foam roller) is used to affect the stressed area. It is made of different materials with different elastic properties: foam plastic, polypropylene foam, polyurethane, wood, etc. Cylinders differ in the composition of the material, which determines their hardness, and in

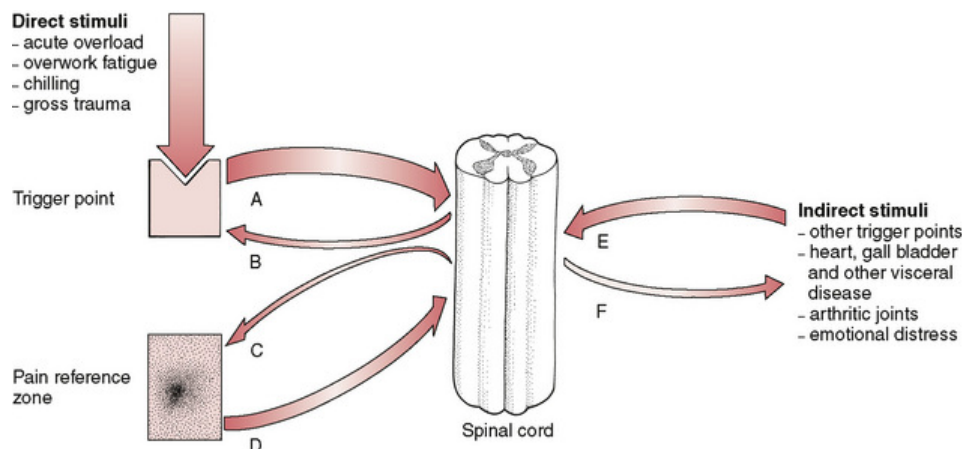


Fig. 1 Mechanism of action of myofascial trigger points and other reflex phenomena (Musculoskeletal Key)

diameter, which provides a larger or smaller area of contact with the body. These differences make it possible to vary the degree of pressure on problem locations of the athlete's body. For a more targeted impact, balls of different diameters and stiffness are also used (for example, a tennis ball).

Also significant is the factor that competitive and training activities of qualified football players are quite traumatic due to their specific nature: constant changes in speed and direction of movements, high coordination complexity of game techniques, variability of offensive and defensive technical and tactical actions, and their combinations, fight for position and the ball (Kostiukevich et al., 2017; Lisenchuk et al., 2022). The complex impact of the above factors leads to injuries of the musculoskeletal system in qualified football players: damage to muscles, ligaments and tendons is a fairly common phenomenon in the competitive and training practice of athletes (Hammami et al., 2016; Taberner & Cohen, 2018; Kadir, & Osman, 2021). Such a situation actualizes the direction of scientific research, which is related to the study of the effectiveness of targeted influence on the musculoskeletal system in qualified football players through the use of special exercises – myofascial release and stretching. Modern scientific researchers testify that the existing complexes of special exercises (stretching tools) are not effective enough, in the context of their systematic use in the training process and competitive activities of qualified football players to prevent injuries and restore the amplitude of movements in the joints (Mohammadtaghi et al., 2016; Evangelos et al., 2017).

Hypothesis. The use of special MFR exercises in the training process and competitive activities of qualified football players will contribute to reducing their injury rates and restoring the amplitude of motion in the joints.

The purpose of the work: to determine the effectiveness of the use of MFR tools used in the training process of qualified football players.

Material and methods

Participants

In order to clarify the opinion regarding the possible use of modern methods of functional training in the process of physical training of qualified football players, a survey of football specialists was conducted at the first stage of the research. Coaches and sports managers of football teams who hold official positions in professional football clubs of the Ukrainian Premier League took part in it: head coaches, assistant head coaches, physical training coaches, sports directors, sports doctors, rehabilitators, experts of complex scientific groups. In total, 28 specialists took part in the survey, who take care of planning and organizing the process of physical training of qualified football players. Table 1 presents the structure of the focus group of specialists who participated in the survey.

All respondents are men, aged from 21 to 70 years. The average age of respondents was 45.5 ± 10.6 years. Specialists who took part in the survey have specialized higher education, coaching (or medical) licenses of the appropriate categories for work with football teams of the Ukrainian Premier League. According to the terms of the contracts, they worked with the teams on a permanent or temporary basis.

Table 1. The structure of the focus group of football specialists who participated in the survey, n=28

Work experience in a football club	Respondents, n	Ratio, %
≤ 5 years	5	17,86
5 – 10 years	6	21,43
10 – 15 years	7	25,00
≥ 15 years	10	35,71
of them, full-time coaches	9	32,14

In the experimental part of the study, 36 highly qualified football players aged 18-30 participated, who during two sports seasons (2018-2019 and 2019-2020) were included in the application letters “A” and “B” of FC “Zorya” (Luhansk) as professional football players and participated in official competitions of the Ukrainian Premier League.

Organization of research

The survey was conducted with the technical support of representatives of the press service of FC “Zorya” (Luhansk). The participants of the survey were given instructions containing a form of consent for the use of the personal data of respondents and experiment participants, an information sheet, and a questionnaire. The information letter explained the aim and objectives of the study, definitions of key terms used in the questionnaire, and contact details of the research team members. The consent form contained personal data identifying the participants of the survey, but it was explained to the participants that filling in this part of the questionnaire was not mandatory.

The ascertainment and formative stages of the pedagogical experiment were carried out within the first and second preparatory periods of the training macrocycle of FC “Zorya” (Luhansk) – sports seasons 2018-2019 and 2019-2020. To determine the impact of the MFR technique on the indicators of injury prevention and restoration of the amplitude of movements in the joints, it is proposed to use exercises with special cylinders “Foam Roller” manufactured by “Everlast” and “Black Roll”. MFR exercises were used in the preparatory and final parts of the training sessions of qualified football players. At the beginning and at the end of the first and second preparatory periods, in each part of the class, flexibility testing was conducted before using MFR tools (determinative stage) and after the proposed changes in the training program (formative stage).

The research was conducted on the basis of the football team of the Ukrainian Premier League – FC “Zorya” (Luhansk), the Department of physical culture and Sports of the Zaporizhzhia National University and the Department of physical rehabilitation, sports medicine, physical education and health of the Zaporizhzhia State Medical University in the period of 2018-2020.

At the first stage of the experiment (2018-2019 sports season), the scientific and methodological literature on the topic of the study was analyzed and summarized, its relevance,

theoretical and practical significance were substantiated, and a program for conducting ascertainment and formative experiments was developed. During the official games and training sessions, the experts of the Ukrainian Premier League teams were interviewed, and the results were analyzed and processed. In the ascertainment experiment, the peculiarities of the dynamics of the flexibility indicators in qualified football players within the annual macrocycle under the influence of the traditional training program were studied.

At the second stage of the experiment (sports season 2019-2020), in the formative experiment, the nature of the changes of the specified indicators under the influence of MFR tools was checked, the effectiveness of the experimental program was evaluated, conclusions and practical recommendations were formulated regarding the use of MFR tools in the training process of qualified football players. During the experimental studies, the participants gave informed consent to the processing of personal data in accordance with the requirements of the Declaration of Helsinki of the World Medical Association "Ethical principles of medical research with the participation of a person as an object of research".

Methods of research

Analysis, generalization, and systematization of data from scientific and methodical literature and the global information network "Internet"; questionnaire survey; pedagogical observations; pedagogical testing of flexibility indicators according to tests: "Inclination from a standing position, cm", "Full bridge from the starting position lying on the back, cm", "Front splits, cm", "Side splits on the left or right leg, cm"; a pedagogical experiment with the stages of ascertaining and formative orientation. A qualitative assessment of the development of the "flexibility" quality in qualified football players was carried out according to the recommendations of scientists and experts (Gomez-Piqueras et al., 2018).

Statistical analysis

The obtained experimental materials were processed by the package of application programs "IBM SPSS Statistics" for Windows and "MS Office Excel" with the calculation of the following indicators: arithmetic mean (\bar{x}); arithmetic mean error (S); σ – mean square deviation; Student's t-test, which is a test of the reliability of the normal distribution for equal and unequal samples with (n-1) degrees of freedom. Statistically reliable differences are accepted as significant at a 5% significance level of $p < 0.05$, which is recognized as

a reliable indicator in pedagogical research (processing of experimental data at significance levels of $p < 0.01$; $p < 0.001$ was also used)

Results

As a result of the analysis of the survey data, it was found that football specialists hold, in general, positive beliefs about the possibilities of using modern technologies of functional training using MFR and stretching tools in the training process of qualified football players (Table 3)

The results of the survey show that 92.85% of football experts believe that muscle elasticity and flexibility are important for the successful competitive performance of qualified football players. A certain conservatism of the opinions of football experts can be seen in the fact that 39.29% believe that the time spent on MFR and stretching in the training process of qualified football players can be used more effectively. 71.44% of the surveyed football specialists believe that MFR tools complement stretching in the training process, which indicates promising opportunities for further differentiation in the use of MFR and stretching as separate methods in various structural formations of the macrocycle. Still, 64.28% of the experts surveyed believe that the use of stretching is more effective than MFR tools in the training process of qualified football players. A rather significant indicator – 46.44% of football specialists do not agree or strongly disagree that MFR tools contribute to the development of flexibility, the restoration of the amplitude of motion in the joints and the reduction of sports injuries. This shows that there is a certain lack of research that convincingly confirms the effectiveness of using these tools in the training process of qualified football players. Another 39.29% of the interviewed specialists strongly disagree or disagree with the statement that the methods that exist and are used today are outdated and require significant modification for use in the training process. 78.57% of specialists believe that the specified innovative methods of functional training increase the effectiveness of the technical and tactical actions of qualified football players, at the same time, 100% consider MFR and stretching as necessary components of the sports training of football players, which indicates the need for widespread use of these methods of functional training in sports training.

35.72% of specialists emphasize that there is a shortage of specialists who are able to integrate new methods of MFR and stretching into the training process of qualified football players at a high professional level, 64.28% – emphasize that, in practice, there is no scientific justification for the use of modern methods of MFR and stretching in sports training of qualified football players.

Table 2. The scale of qualitative assessment of the level of physical preparedness in qualified football players based on flexibility indicators (Kostiukevych et al., 2019)

	low	below average	average	above average	high
Inclination from a standing position, cm	-10 – -5,1	-5,0 – -0,1	0 – 4,9	5 – 9,9	10 ≥
Full bridge from the starting position lying on the back, cm	75,0 ≥	74,9 – 70,0	69,9 – 65,0	64,9 – 60,0	59,9 ≤
Front splits, cm	65,0 ≥	55,0 – 64,99	45,0 – 54,99	35,0 – 44,99	34,99 ≤
Side splits on the left (right) leg, cm	45,0 ≥	40,0 – 44,99	35,0 – 39,99	30,0 – 34,99	29,99 ≤

Table 3. The results of a survey of football specialists regarding the use of MFR and stretching in the training process of qualified football players, %

Categories of questions	Categories of answers				
	strongly disagree	disagree	difficult to answer	generally agree	completely agree
Muscle elasticity and flexibility are important for football players	0	0	7.15	60.71	32.14
the time spent on MFR and stretching can be used more efficiently	14.28	39.28	7.15	32.14	7.15
MFR complements stretching in the training process	0	14.28	14.28	64.29	7.15
The use of stretching is more efficient than MFR	3.57	14.28	17.87	57.13	7.15
MFR helps develop flexibility, restore amplitude of motion, and reduce injuries	21.44	25.00	28.56	25.00	0
the methods that exist are outdated and need to be modified for use in the training process	7.15	32.14	25.00	25.00	10.71
innovative methods of functional training (MFR, stretching) increase the effectiveness of the technical and tactical actions of football players	0	7.15	14.28	50.00	28.57
MFR and stretching are necessary components of the training process	0	0	0	57.15	42.85
there is a shortage of specialists who are able to integrate new MFR and stretching techniques into the training process	7.15	14.28	42.85	35.72	0
there is no scientific justification for the use of modern methods of MFR and stretching in the training process	3.57	7.15	25.00	50.00	14.28

In addition, on the basis of the generalization and extrapolation of data from a questionnaire survey of football specialists of Ukrainian Premier League teams, including physical training coaches and specialists of complex scientific groups, an approximate distribution of types of sports training by volume and percentage ratio was made in the structure of the preparatory period of the annual macrocycle of training professional football teams (Table 4).

Analysis of the data given in Table 4 allows us to state that, according to the interviewed experts, up to 54.58% of the volume of training loads in the preparatory period of the training of qualified football players falls on the

Table 4. Approximate distribution of types of training load during the basic microcycle in the preparatory period of the annual macrocycle according to the results of a survey of UPL football coaches, n=28

Orientation of preparation	Amount (hours per week) $\bar{X} \pm S$	Ratio, %
Technical and tactical training	4.35 ± 0.12	24.17
General and special endurance	4.20 ± 0.19	23.33
Strength training (with resistance)	2.92 ± 0.17	16.25
Speed training	2.70 ± 0.12	15.00
Flexibility (active and passive)	1.80 ± 0.11	10.00
Integrated training	2.03 ± 0.11	11.25
Total	18.0	100

development (improvement) of the physical and functional readiness of the players as the basis of a high level of physical performance during a long competitive period. This is significant in the context of the axiomatic statement that, precisely, a high level of physical work capacity based on the development of special motor abilities is a necessary prerequisite for the effective implementation of the existing technical and tactical potential in qualified football players in the competitive process during the macrocycle of training. In this context, the ratio seems logical – up to 35.42% of the number of training loads in the preparatory period of training of qualified football players has a technical and tactical or integral focus. As a result, the two main types of training: 1) with a primary focus on the development (improvement) of physical and functional readiness and 2) with a primary focus on the development of technical and tactical skills and integral preparedness of football players, account for about 90% of the total amount of training and competition loads.

Flexibility development tools, including MFR and stretching, account for about 10% of the total volume of loads in the preparatory period of training of qualified football players (Fig. 2).

During the approbation of the specified means and methods of their implementation in the training process of FC “Zorya” (Luhansk), the following results were obtained (Table 5).

As a result of the pedagogical testing of the flexibility indicators of football players of FC “Zorya” (Luhansk), at the end of the first preparatory period, the following results were obtained: statistically significant differences were recorded

Table 5. Flexibility indicators of football players of FC “Zorya” (Luhansk) in the basic microcycles of the preparatory period of the 2018-2019 and 2019-2020 seasons, ($\bar{x} \pm S$), (n=36)

The indicators under study	At the end of the 1st PP		$\Delta 1\%$	At the end of the 2nd PP		$\Delta 2\%$
	2018/19 pp.	2019/20 pp.		2018/19 pp.	2019/20 pp.	
Inclination from a standing position, cm	-4.93±0.05 average	-4.10±0.05*** below average	16.8	-4.55±0.15 below average	-3.25±0.15*** below average	28.6
Full bridge from the starting position lying on the back, cm	64.85±2.05 average	60.50±1.05* average	6.71	68.50±1.05 average	64.50±1.05* above average	5.84
Front splits, cm	49.50±1.50 average	49.03±0.14 average	0.95	50.0±1.01 average	45.50±1.50** average	9.0
Side splits on the left (right) leg, cm	34.50±1.55 above average	32.40±1.20* above average	6.09	36.50±1.50 average	33.33±1.30** above average	8.68

Notes: * – $p < 0.05$; ** – $p < 0.01$; *** – $p < 0.001$ – compared to the results of the previous sports season

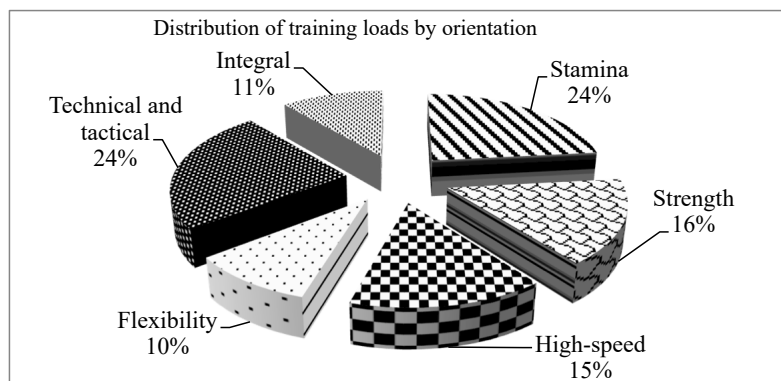


Fig. 2. Approximate distribution of training loads (by predominant orientation) in the basic microcycle of the preparatory period of training of qualified football players

according to the results of the tests “Full bridge from the starting position lying on the back” and 60.50±1.05 cm, respectively); “Side splits on the left (right) leg” (34.50±1.55 cm and 32.40±1.20 cm, respectively), $p < 0.05$. A more significant difference was recorded in the result of the test: “Inclination from a standing position” (result of the previous season -4.93±0.05 cm and -4.10±0.05 cm in the 2019/20 season, $p < 0.001$), which corresponds to the “above average” level of development. Two indicators corresponded to the “average” level: the tests “Full bridge from the starting position lying on the back” and “Front splits”, according to the indicators of the test “Side splits on the left (right) leg”, the indicators were recorded at the level of “below average” (Table 2).

The indicators of the comparative analysis of the results of testing the flexibility of FC “Zorya” (Luhansk) football players during the second preparatory period of the 2018-2019 and 2019-2020 sports seasons indicate that it was possible to achieve a higher level of flexibility of the football players of FC “Zorya” (Luhansk) in comparison with the results of the previous season. Statistically reliable differences ($p < 0.001$) of 28.6% were recorded according to the indicators of the flexibility test in the lumbar spine “Inclination from a standing position”. Also, statistically reliable differences

in indicators were recorded according to the results of the “Front splits” and “Side splits on the left (right) leg” tests ($p < 0.01$), which characterizes the manifestations of flexibility in the hip joints; according to the test “Full bridge from the starting position lying on the back” ($p < 0.05$).

The analysis of the results of the flexibility testing of football players of FC “Zorya” (Luhansk) at the end of the first and second preparatory periods of the 2019-2020 sports season allows us to state that there are higher flexibility indicators compared to the results of the preliminary testing in the 2018-2019 sports season (statistically reliable differences at the levels: $p < 0.05$; $p < 0.01$; $p < 0.001$). Also, in the 2019-2020 sports season, according to the results of monitoring by specialists of the complex scientific group of FC “Zorya” (Luhansk), a decrease in the number of sports injuries related to damage to the muscle and ligament structures of the lower limbs and trunk of football players was recorded – by 11.11%.

Also, in the process of experimental research, the following options for the practical use of MFR tools were determined by the methods of pedagogical observation, generalization, and systematization of the obtained data in accordance with the purpose, tasks, and orientation of specific training sessions:

1) in the preparatory part – in order to increase the amplitude of movements in the joints and prevent injuries in the main part; to reduce the risk of injury of football players during further high-amplitude motor actions and high-intensity training;

2) in the final part – with the aim of accelerating metabolic processes in the muscular-ligamentous structures of the musculoskeletal system of football players and reducing the manifestations of muscle pain after significant physical exertion;

3) as an independent training tool – for the purpose of rehabilitative effects on painful areas of the musculoskeletal structures of the musculoskeletal system of football players to reduce muscle tone and develop flexibility.

The results of using manual MFR techniques are:

- relaxation of chronically tense muscles;
- restoration of mobility and normal (physiologically determined) amplitude of motion in the joints;
- improving the elastic properties of the muscular and ligamentous structures of the musculoskeletal system of football players;
- optimization of hemodynamics and lymphodynamics at the microcirculatory level;
- optimization of general and local metabolic processes in the body;
- restoration of the functions of the musculoskeletal system of football players after excessive physical exertion and injuries;
- improvement of proprioception and neuromuscular control;
- optimization of the psycho-emotional state.

Discussion

In the course of the experimental research, a scientific problem with elements of scientific novelty was raised: the effectiveness of the program of using MFR tools for the prevention of injuries and restoring the amplitude of motion in qualified football players was experimentally substantiated and proven. In addition, the data related to the determination of options for the practical application of MFR tools in accordance with the purpose, tasks, and focus of specific training sessions for qualified football players were summarized and systematized: in the preparatory part; in the final part; as an independent training tool. Added data on the improvement of the system of long-term sports training in football in the context of the use of means of injury prevention, correction of physical condition and recovery of athletes' bodies after significant physical exertion (Kostiukevich et al., 2017; Lisenchuk et al., 2022). Data on the effectiveness of the integrated use of MFR, stretching and therapeutic exercises in the rehabilitation therapy in qualified football players after injuries and disorders of the musculoskeletal system have gained further development (Kisilewicz et al., 2018; Doroshenko et al., 2019).

The results of the experimental studies presented in the paper allow us to state that the modern system of multi-year sports training requires the search for innovative methodological approaches to improving the training process of qualified athletes (Mitova, 2020; Komotska & Sushko, 2022), including qualified football players (Kokareva et al., 2018; Selmi et al., 2018). A long competitive period

in modern football – 8-10 months of a calendar year, high physical loads in terms of volume and intensity, highly variable competitive activity with the cumulative effect of stress agents of a socio-psychological nature actualizes problematic issues (Lisenchuk et al., 2019), related to the search and implementation of effective methods of restoring the physical condition in qualified football players, means of their rehabilitation and prevention of sports injuries (Dalla Rosa Nogales & Nogales Zafra, 2019; Morris et al., 2019; Ramirez-Campillo et al., 2019).

One of these tools is manual MFR techniques (Das et al., 2022), which are recommended to be used as a means of preventing sports injuries and restoring amplitude of motion in qualified football players after injuries, damage, and significant physical exertion (Doroshenko, 2015; Doroshenko et al., 2019) in combination with stretching exercises and other therapeutic exercises to enhance the overall effect.

An additional significant factor in solving this problem is the global injury prevention program “FIFA 11+”, which was developed by the FIFA Medical Assessment and Research Center (F-MARC), tested and implemented in the activities of many national football associations with the aim of reducing sports injuries among football players of different ages and genders, qualifications (Sadigursky et al., 2017; Patti et al., 2022; Vlachas & Paraskevopoulos, 2022). Currently, the global injury prevention program “FIFA 11+” is also used in other sports, for example, in basketball (Longo et al., 2012). It is shown that the exercises used in the “FIFA 11+” program contain separate elements of MFR, and stretching, which significantly reduces heavy injuries. In particular, these are running exercises at a slow speed in combination with MFR and stretching exercises; functional training for the trunk and limbs, balance exercises, agility, and plyometric exercises; running exercises at a moderate or high speed, integrated with a change in the direction and speed of movement.

Overall statistics vary significantly in the amplitude of a 30%-70% reduction in sports injuries when using the global program “FIFA 11+” (“FIFA 11+ Program: Soccer Injury Prevention”).

Also significant is the analysis of the opinion of practical football specialists who work in professional football clubs regarding the use of MFR tools in the training process of qualified football players. The vast majority of interviewed experts consider MFR tools effective in the functional training system (78.57%) and the integrated use of MFR tools and stretching in the sports training of qualified football players is necessary (100%). Meanwhile, 64.28% of the interviewed specialists emphasize that, as of today, there is practically no scientific justification for the effectiveness of modern MFR and stretching methods in the sports training of qualified football players. This indicates the presence of a finally unsolved problem related to the effective integrated use of MFR and stretching in the training process of qualified football players, which requires further detailed research and confirms the conclusions of scientists (Manzi et al., 2020; Das & Jhajharia, 2022).

On the basis of the above, we consider it necessary to focus attention on the following problematic issues, which relate to the raised issue. Firstly, the need to correct the modern system of long-term sports training, in the context

of a wider use of means of prevention of sports injuries and restoration of functional capabilities in qualified football players (Kostiukevych et al., 2019; Lisenchuk et al., 2019). Secondly, the details of scientific research aimed at determining the effectiveness of the integrated use of MFR, stretching, and therapeutic exercises in the training process of football players of different ages, genders, and qualifications (Doroshenko, 2015; Evangelos et al., 2017).

Prospects for further research are based on the expansion of additional means of prevention of sports injuries and recovery of the body in qualified football players after significant loads, rehabilitation after injuries, and damage to the musculoskeletal system. In particular, this applies to the use of neuromuscular training exercises, which are designed to restore normal combinations of individual locomotor acts at the first stages of motor activity recovery, to ensure control and coordination of muscle activation. Increasing the effectiveness of neuromuscular training exercises at the first stages of rehabilitation therapy after complex injuries of the musculoskeletal system can significantly accelerate the rehabilitation in qualified football players.

Conclusions

Analysis of data from scientific literature and the global information network "Internet" allows us to state that the practice of using MFR tools in the training process of qualified football players is not systematic.

A questionnaire survey of football specialists working in clubs of the Ukrainian Premier League shows their understanding of the need to introduce MFR tools into the training process of qualified football players – 78.57% of experts believe that the use of innovative methods of functional training increases the effectiveness of technical and tactical actions of qualified players football players; 100% – consider the integrated use of MFR and stretching in the sports training of qualified football players to be necessary.

The analysis of the results of testing the flexibility of football players of FC Zorya (Luhansk) at the end of the first and second preparatory periods of the 2019-2020 sports season allows us to state the presence of higher indicators compared to the results of the preliminary testing in the 2018-2019 sports season (statistically significant differences in levels: $p < 0.05$; $p < 0.01$; $p < 0.001$). Also, in the 2019-2020 sports season, according to the results of monitoring by specialists of the complex scientific group of FC "Zorya" (Luhansk), a decrease in the number of sports injuries related to damage to the muscle and ligament structures of the lower limbs and trunk of football players was recorded – by 11.11%.

Variants of practical application of MFR tools have been determined in accordance with the purpose, tasks and focus of specific training sessions: in the preparatory part; in the final part; as an independent training tool.

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Conflict of interest

The authors state no conflict of interest.

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МІОФАСЦІАЛЬНИЙ РЕЛІЗ ЯК ЗАСІБ ПРОФІЛАКТИКИ ТРАВМАТИЗМУ І ВІДНОВЛЕННЯ АМПЛІТУДИ РУХІВ У КВАЛІФІКОВАНИХ ФУТБОЛІСТІВ

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 9 с., 2 табл., 1 рис., 27 джерел.

Мета дослідження – визначити ефективність застосування засобів MFR, які використовуються у тренувальному процесі кваліфікованих футболістів.

Матеріали і методи. Контингент: 28 фахівців з футболу футбольних команд української Прем'єр-Ліги; 36 футболістів ФК «Зоря» (Луганськ). Методи: аналіз, узагальнення та систематизація даних науково-методичної літератури і глобальної інформаційної мережі «Internet»; анкетне опитування; педагогічні спостереження; педагогічне тестування показників гнучкості, педагогічний експеримент, методи математичної статистики.

Результати. Результатом застосування мануальних технік MFR у тренувальному процесі кваліфікованих футболістів є: розслаблення хронічно напружених м'язів; відновлення рухливості та нормальної амплітуди руху у суглобах; поліпшення еластичних властивостей м'язово-зв'язкових структур опорно-рухового апарату футболістів; оптимізація гемодинаміки і лімфодинаміки на мікроциркуляторному рівні; оптимізація загальних і локальних метаболічних процесів в організмі; відновлення функцій опорно-рухового апарату футболістів після надмірних фізичних навантажень і травм; поліпшення пропріорецепції та нейро м'язового контролю; оптимізація психоемоційного стану.

Висновки. Аналіз результатів тестування гнучкості футболістів ФК «Зоря» (Луганськ) наприкінці першого та другого підготовчих періодів спортивного сезону 2019-2020 рр. дозволяє констатувати наявність більш високих показників у порівнянні з результатами попереднього тестування у спортивному сезоні 2018-2019 рр. За результатами моніторингу фахівцями комплексної наукової групи ФК «Зоря» (Луганськ), зафіксовано зменшення показників спортивного травматизму, які пов'язані з пошкодженнями м'язово-зв'язкових структур нижніх кінцівок і тулубу футболістів – на 11,11%.

Ключові слова: засоби MFR, профілактика, травматизм, амплітуда рухів, футбол.

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