



Electrical stimulation of the leg muscles and its effect on the strength and accuracy of kicks in football

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الكلمات المفتاحية : التحفيز الكهربائي، تدريب EMS، قوة الرمي، دقة الرمي، العملية التدريبية للاعبين كرة القدم
ملخص البحث :

في السنوات الأخيرة، جذبت أساليب استخدام الوسائل غير التقليدية للتدريب الرياضي اهتماماً متزايداً من المدربين والرياضيين. ترتبط الحاجة إلى تطوير وتنفيذ أساليب جديدة لإتقان الحركات الرياضية بزيادة كبيرة في الأحمال في معظم الألعاب الرياضية، وبطبيعة الحال، الوقت الذي يقضيه في التدريب. يناقش المقال إمكانيات استخدام تدريب EMS لتحسين قوة ودقة الركلة في كرة القدم. تم وصف عملية التدريب باستخدام EMS، وتم توفير بيانات الاختبار للمجموعات التجريبية والضابطة قبل وبعد تنفيذ البرنامج التدريبي لتقييم التغيرات في نتائج الرياضيين.

Abstract:

in recent years, methods of using non-traditional means of sports training have attracted increasing attention from coaches and athletes. The need to develop and implement new methods for mastering sports movements is associated with a significant increase in loads in most sports and, naturally, the time spent on training. The article discusses the possibilities of using EMS training to improve the strength and accuracy of a kick in football. The training process using EMS is described, and test data .experimental and control groups before and after the implementation training program is provided to assess changes in the athletes' results.

Keyword :electrical stimulation, EMS training, throwing power, throwing accuracy, training process of football players



Introduction :

Today, new technologies are used along with various Training areas improve players. It is important use methods Which gives a response similar effectiveness introduce new method training. have a positive impact on athletic performance within short period [3].

Using practical methods to maintain the best results is the use of electrical stimulation through precise devices. Its goal muscles through repetitive contractions improve their basic properties [2]. Yakov Coates says that electrical currents that stimulate contractions create very high isometric forces - from 10% to 30% depending maximum contractions required. This lead greater strength development in professional players [1].

(EMS) is a modern, A time-saving training method that also reduces the effort of activating the muscles by delivering current to the muscles. It has been observed that the use of EMS accelerates the elimination of muscle waste by increasing blood flow, which leads to recovery of performance during exercise or recovery [6].

EMS is used by sports scientists to help keep player safe during exercise. Ensuring maximum training efficiency, completing more tasks in less time, minimiz fatigue achieving optimal performance is critical [5].

In EMS sessions, muscles are exposed to more intense electricity to contract and move compared to regular exercises, and these increased signals sent by the central nervous system lead to muscle contractions. All major muscle groups can be stimulated, as well as the more difficult and deeper muscles. Muscles can be trained more precisely and in a shorter period of time without using any weights or even the slightest pressure on the joints compared to the old methods, which leads to increased performance without external pressures[4].

However, during the analysis of scientific publications on this topic, it was found that the use of electrical stimulation in the training process of athletes has not yet been fully studied. This especially applies to the training of football players. Existing studies are devoted to analyzing the effect of such stimulation on the muscles of athletes, but it has not been fully explored how electrical stimulation can affect the increase in strength and throwing accuracy in football.

1- Purpose of the study



The purpose of the work was to identify possibilities for increasing the strength and accuracy of a football strike through stimulating muscle activation.

The manuscript was conducted based on an 8-week EMS training course. EMS training sessions were carried out 3 times a week, the duration of each session was 12 minutes. The impact was on the quadriceps muscles of both legs. As part of the training, a Multi simulator (La Roque D'antheron, France) used, with knee fixed at an angle of 60°. a portable Energy simulator (Medicompex SA, Ecublens, Switzerland) also used. Three electrodes were placed on each thigh. Positively charged electrodes (5*5 cm) were placed next to the motor zone of the vastus femoris muscles, negatively charged (10*5 cm) - near the proximal point of attachment of the rectus femoris muscle. A frequency of 100 Hz and a duration of 400 μ s were used for stimulation.

The duration of electrical stimulation was 3 seconds, followed by a 17-second pause. Within each training session, 36 contractions were performed. The maximum permissible current ranged from 60 to 120 mA.

To determine the effectiveness of using electrical stimulation during the training of football players, control tests were conducted before the start of classes and after the end of the course. Efficiency assessment was carried out by comparing results of experimental and control groups.

2- Method and Procedure:

The experimental method was used

2-1 Research Sample:

The study involved players of the Diwaniya football club aged 17-19 years. The experimental and control groups each included 10 football players from this club.

Control tests. Impact speed was determined from maximum ball speed using 44 Check Speed radars (Tibar Industries, Downview, Canada). speed recorded by radar located closest impact site was taken into account. blows were made with dominant leg without a run-up (one step before the impact) and with a run (3 steps before the impact). best 3 attempts for both tests recorded.



To determine the level of development of kick accuracy, the methodology for assessing the effectiveness of shots on goal by S.V. Rodionov was used. Explained by Sobyannin F. As a result of the test, kicks were taken from three starting positions: at the penalty area line, the kick was taken after an undulating movement between the goalposts with the ball from a distance of 10 meters to the penalty area line, at a distance of 10 metres, five dribbles were taken to the penalty area line, followed by a kick. In each case, the ball must travel through the air through the goal area. In each starting position, three positions were determined for performing shots on goal (left, center, right). From each position, 3 kicks were performed (all kicks were performed with the “strongest” leg) in the indicated ways: from running up to a stationary ball, after dribbling the ball, after dribbling the ball with a stroke of five chips. results of all strikes were recorded in the protocol. The sum of points of all strikes from each position in three starting positions was determined

Maximum possible score: 27 hits x 4 points = 108 points. Test takers move left to right, hitting ball at each position.

2-2 Tools and equipment used in the research:

- **football stadium**
- **Footballs**
- Metric tape measure**
- **Signs**
- **Colored adhesive tape**
- **A football goal with accuracy test squares on it**
- **Photography cameras**

2-5 main experiment



2.5-1 Pretest:

With the cooperation of the assistant team, study tests were conducted on Friday and Saturday at four in the afternoon at the Diwaniyah Club Stadium, and the study data was recorded (strike force and strike accuracy).

2-5-2 Training Curriculum:

The researcher, in cooperation with the Diwaniyah Club coach, implemented special way curriculum after prepare the samples.

Training begins in Special Training part. For 6 weeks as follows:

- 1. Electrical stimulation is applied during special preparation of study specimens.**
- 2. program (6) weeks.**
- 3. program time (80-95) minutes (4) per week.**
- 4. from December 12, 2023 to July 1, 2023.**
- 5. first week of course, Units 1 and 2, is how to deal with the practical and complete curriculum of the training course. The progress training curriculum and the training phase were monitored by the trainer.**
- 6. Introducing electrical stimulation with the training units**

2-3-2 Post-test:

After completing the application of the training curriculum components, the researcher conducted the post-test for the experimental and control groups, in addition to taking performance data under the same conditions as the pre-test.

2-6 Statistical means:

The statistical package was used to analyze the sample data statistically

3- Present, analyze and discuss the results:

3-1 Discussing the results of the pre- and post-tests of the manuscript tests.



The table shows the average performance for the experimental and control groups at the initial and control stages.

(Table 1)

Results of tests on the strength and accuracy of impact in the experimental and control groups

groups	Impact strength		Hit accuracy	
	pre	post	pre	post
experimental	87,8	94,5	82	91
control	88,1	89,5	81	84

At the initial stage of the research, it was found that the indicators in the experimental and control groups did not have significant differences. At the same time, repeated diagnostics showed that in the control group there were no significant dynamics of improvement in performance on both tests.

In the experimental group, one can note the presence of positive dynamics after EMS training. Thus, the impact force increased by $6.7 \pm 9\%$ according to the results of control tests after training. Correlation analysis using the Wilcoxon T-test showed the presence of significant differences in the experimental group ($\text{Temp} = 10.5^{**}$ at $P \leq 0.05$). However, no significant differences were found in the control group ($\text{Temp} = 14.3$ at $P \leq 0.05$).

Analysis of the results on the accuracy of strikes also showed that in the experimental group the average indicator increased by $9 \pm 7\%$, in the control group changes of $3 \pm 2\%$ were noted. Correlation analysis using the Wilcoxon T-test also showed the presence of significant differences in the experimental group ($\text{Temp} = 9.8^{**}$ at $P \leq 0.05$). However, no significant differences were found in the control group ($\text{Temp} = 14.7$ at $P \leq 0.05$). This allows us to conclude that the use of EMS training is effective for improving the strength and accuracy of a strike.

4-

4.1 Conclusions



In this case, we can conclude that in addition to the already proven positive effect of EMS training on the force of voluntary contraction, this training program can improve more specific characteristics, such as the strength and accuracy of kicks in football. The positive effect on these indicators is that the quadriceps femoris muscle is very important in the mechanism of hitting the ball. For football players, not only tactical, but also physical training is important. The introduction of EMS training allows you to improve a number of indicators that affect performance during the game. In addition, EMS training can be used for injured athletes to more quickly adapt to physical activity.

4.2 Recommendations

1. When organizing EMS training to increase the strength and accuracy of strikes, football players can use a series of training sessions three times a week, within which the quadriceps muscles of the thigh of both legs are affected.
2. The time was 12 minutes, the effect on the muscle was 3 seconds, followed by a 17-second rest.
3. EMS training can be used for injured athletes in order to adapt to physical exertion more quickly.

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