

The effect of using electrical stimulation and massage within a suggested device to restore muscle lengthening for athletes with a moderate-intensity muscle tear in some posterior thigh muscles

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Abstract

The purpose of this paper is to identifying the effect of the proposed device using electrical stimulation and massage on the variable (muscular lengthening). The experiment was conducted on a sample of players of various sports and injured for the period between (10/11/2022) to (10/3/2023). The researchers used the experimental approach to design the experimental group. The one with the pre, intermediate, and post-test due to its suitability to the nature of the research problem and to achieve its purpose, and the data was processed using the statistical bag (SPSS), and through the results collected, it was concluded that stimulation and electrical massage had positive effects in restoring muscle lengthening as soon as possible, and then returning Injured players to the fields of play, where it contributed to the return of the injured posterior thigh muscles to the normal state, and the researchers recommended to be guided by the proposed device, which was designed to rehabilitate the other injured thigh muscles.

keywords: Injuries, moderate-intensity muscle tear, posterior thigh muscles, electrical stimulation and massage, muscle lengthening, various sports, injured, normal condition.

Introduction:

The percentage of these injuries is high in sports competitions due to the intensity of the competition, as well as the training load and the physiological changes that the players go through, and the high intensity in performance is one of the main causes of injury to the posterior thigh muscles, as well as neuromuscular fatigue from the important reasons, the progression of the biological age of the athlete, weak muscle strength and lack of muscle elasticity As for pathological conditions that the player is exposed to, which lead to repeated injuries, this is one of the most important factors causing injuries to the thigh muscles, as well as the presence of previous injuries, the size of muscle ruptures, and the shortening of muscle bundles, which leads to recurrence of the injury in the same muscle. When this injury occurs, symptoms appear, including sudden pain in the thigh area. The background and the appearance of swelling at the site of the injury, and sometimes a gap in the muscle and heaviness in the leg of the injured player. In severe cases, a sound can be heard due to the pooling of plasma, and the tensile force on the muscles leads to an overlenghtening of the muscle fibers and thus ruptures them partially or completely (Santanna, Pedrinelli, Hernandez, & Fernandes, 2022, p. 2). And that the muscles of the

lower extremities are at risk of tearing during an eccentric contraction due to a sudden change in movements or excessive lengthening (Guermazi, et al., 2017, p. 647), and the problem lies in a large number of injuries to this important muscle, which is the moderate-severity muscle tear in some posterior thigh muscles

The research aims to know the effect of the proposed device using electrical stimulation and massage on the variable (muscular lengthening) where it mentions (Bispo, et al., 2021, p. 417) the benefits of electrical stimulation of the muscles as it contributes to increasing the strength of the injured muscles and improving performance in functional activities and work It reduces pain and increases range of motion. The benefits of massage are increased skin and muscle temperature, increased flow of oxygen-rich blood, increased sympathetic activity (neuromuscular excitation), relief from pain and muscle spasm, relief from anxiety, assistance in relaxation, elimination of fatigue, recovery after stress, prevention of injuries and reduction. The frequency of its occurrence (Hume & Kolt, 2005, pp. 235-254), and the sample consisted of team and individual sports players, including those who were injured for the period from (10/11/2022) to (10/3/2023), and the experiment was conducted at the

University of Baghdad / College of Physical Education and Sports Sciences (Biomechanics Laboratory, Fitness Halls) Ministry of Health / Baghdad Health Department Al-Rusafa / Medical Rehabilitation and Joint Diseases Center, Ministry of Youth and Sports / Department of Sports Medicine and Physiotherapy, and dealt with issues The research examined some previous studies, including the study of (Saleh and Al-Taie, 2019).

Where the aim was to prepare a rehabilitative curriculum with therapeutic exercises that takes into account the specificity of each muscle of the posterior thigh muscles affected by the partial rupture in order to rehabilitate them in a scientific way based on the mechanics and characteristics of each muscle, and its results were significant due to the impact of the rehabilitative approach. And a study (Ismail, 2016) With the aim of designing a rehabilitative program using exercises with laser and electrical stimulation in some cases of partial rupture of the posterior thigh muscle that do not require surgical intervention, the study found an improvement in the mean scores of the post-test measurements in each of the pain level, muscle strength and motor range, and the study (Abdel Aziz, 2015) Which aimed to build a rehabilitative program (physical - health - psychological) and its effect on the speed of recovery from the rupture of the posterior thigh muscles of the athletes. And the circumference of the thigh muscles and the speed of recovery from injury significantly, as for the study (Sullivan & Ceallaigh, 2018) , where the aim was to test the weakness of the knee muscles present in Irish football players who returned to full activity after suffering from a rupture of the posterior thigh muscles. Comparisons with other players who were not injured, and a study (ARNASON & OTHERS, 2008) it aimed to test the effect of central muscle contraction exercises and flexibility training on the injury of the posterior thigh muscles of football players. (Sullivan, Ceallaigh, & Connell, 2008) , which aims to influence both warm-up, static lengthening and mobile lengthening on the flexibility of the posterior thigh muscles of individuals who have previously been injured. The results of the study concluded that individuals who practiced static lengthening did not have an injury compared to individuals who practiced mobile lengthening and return to the stadiums and reduce the recurrence of the injury in the future among team and individual players, after the diagnosis of the specialist doctor in the field of injuries and the end of the drug chemotherapy specified by the doctor.

Research objective:

- Identifying the effect of the proposed device using electrical stimulation and massage on the variable (muscular lengthening).

Research methodology and field procedures:

Research Methodology:

The problem forced the researchers to use the experimental approach by designing one experimental group with a pre-, intermediate, and post-test due to its suitability to the nature of the research problem and to achieve its objective.

Community and sample research:

The research sample, they were chosen by the intentional method, and their number (seven) was from advanced athletes with moderate-intensity muscle rupture in one of the posterior thigh muscles. They are homogeneous in the degree of injury (moderate severity) and different in the affected limb (right or left). Those who refer to the Medical Rehabilitation Center, Joint Diseases, and the Department of Sports Medicine and Physiotherapy, after completing medical treatment.

Tools:

The based on the development achieved through the use of modern devices and tools, the researchers used electrical stimulation and massage, which is an electronic board for stimulation and electrical massage located in a special bag attached to a belt around the patient's waist, where electrodes are placed on the affected muscles, and neuromuscular electrical stimulation works to stimulate the muscles To contract using electrical impulses that stimulate motor neurons directly, and to enhance muscle strength and ability by stimulating and rebuilding muscle fibers and increasing the flow of oxygen-rich blood to the muscles, due to the electrical impulses conducting cycles of contraction and relaxation without making movement, and it is useful for individuals during the stages of rehabilitation and reducing pain, in addition to massage that works to relax the muscles and return to the normal state (figure 1), and (Shennawah, 2019, page 28) believes that the use of tools and devices leads to an improvement in the level of injury, a shortening of time in the process of functional rehabilitation of the injured member, and an increase in the ability of Motor performance with high efficiency.



Figure (1): Shows electrical stimulation and massage of muscles



Figure (4) Show the electrodes

Contains of the following parts:

- An electronic board containing three control buttons and four lights, its dimensions are (4 * 3) cm, Figure (2).
- A cable to connect the electronic board to the electrodes, with a length of (75) cm, Figure (3).
- Surface electrodes (electrodes) number (2), figure (4).
- A battery to supply the electronic board with energy.

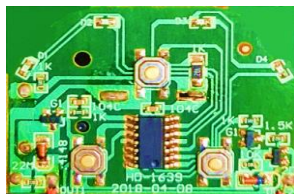


Figure (2) Show the electronic board



Figure (3) Show the connection cable

A lengthening test was used for the posterior thigh muscles (Saleh, 2019, p. 75).

The researchers conducted the pre-test on the sample at different times, and after (4) weeks had passed, they performed the intermediate test, then after (8) weeks had passed, the post-test was conducted. During the period between the tests, stimulation and electrical massage were used, and the gradual increase in the intensity of the muscles was done. To contribute to her rehabilitation as a result of the moderate-intensity muscular rupture in some of the posterior thigh muscles.

Statistical methods: The search data was processed through the Statistical Package for the Social Sciences (SPSS).

- Arithmetic mean.
- Standard Deviation.
- Analysis of variance for repeated measures.
- Mauchly's test for sphericity.
- Bonferroni test for bilateral comparisons.

Results and discussion:

Table (1) shows the arithmetic mean, standard deviation, mean of squares between tests, variable error, calculated (F) value, Sig value, and the type of difference for lengthening the posterior thigh muscles in the pre-test, inter-test, and post-test.

variable	arithmetic mean	standard deviation	Mean squares between tests	variable error	F value calculated	Level Sig	Type Sig
Pre-test	135.71	1.496	3678.143	0.532	6917.104	0.000	Sig
inter-test	115.86	1.864					
post-test	90.00	1.826					

- Measurement unit: degree
- Sig < (0.05) at a degree of freedom (12:2) and below a level of significance (0.05)

Table (2) shows the Mauchly's sphericity test - Mauchly's coefficient, degree of freedom, and Sig value for lengthening the posterior thigh muscles

Effect within the tests	Mauchly's coefficient	degree of freedom	Sig
lengthening the posterior thigh muscles	0.847	2	0.660

- Sig > (0.05)

Table (3) shows the Bonferroni test - difference of the arithmetic means, standard deviations and Sig value to lengthening the posterior thigh muscles

Tests	Difference of the arithmetic means	standard deviations	level sig
Pre-test - Inter-test	19.857	0.340	0.000
Inter-test - Post-test	25.857	0.459	0.000
Pre-test - Post-test	45.714	0.360	0.000

- Measurement unit: degree

- Sig < (0.05)

Discussion:

Physiologists have known the existence of electrical currents in the nerves and muscles of humans since the year (1846), and the first records of the use of electrical stimulation of muscles did not spread until the early twentieth century (Enoke, Amiridis, & Duchateau, 2020, p. 40), It is a method of clinical physical therapy that uses electric current by placing electrodes on the skeletal muscles, with the aim of restoring the normal state or stabilizing the affected area (Castillo, 2015, p. 240), and medical services have become an urgent necessity, not only in terms of their existence, but also their development and the need to provide capabilities, cadres, equipment, and competencies, (Mahdi, Hussein, and Zinad, 2021, page 123), and that the sensory system of the muscles is represented by the muscular spindles in terms of the excitation of the muscular fibrils that give them high and precise stimulation and the Golgi tendon organs that regulate their work with the muscle spindles to protect the body from excessive exchange of contractions (Ghanem and Abdul Hassan, 2022, page 125), through the tables (3, 2, 1) it is clear that there are significant differences, and we find that the arithmetic mean is lower in the inter- and post-test than the pre-test of the muscular lengthening variable, and the researchers attribute the reason to the success of the rehabilitation program that they developed using the proposed device, which contained stimulation and massage to increase the level of lengthening the muscle of the posterior thigh muscles, as well as the decrease in pain and its removal in the research sample led to a very large decrease in the angle of flexion of

the hip joint and its return as close as possible to the natural state, as the removal of pain resulting from the injury in the advanced stages of the rehabilitative curricula had a positive effect on improving the range of motion And increase the lengthening of the muscles working on them (Rauf, 2005, pg. 96), in addition to the contribution of muscular stimulation to the return of muscle lengthening to its normal position by stimulating blood circulation in the injured muscles and working to build the damaged muscle fibers and preventing muscle atrophy as a result of the injury, as well as massage at the end of the rehabilitation unit to help relax the muscles after resistance exercises, as well as confirmed by (Hamza and Ali, 2022, p. 160), on the use of massage and electrical muscle stimulation, and the success of electrical stimulation and massage is confirmed by (Abdel Nasser, 2010) (Faqir, 2009) (Ahmed, 2009) (Muhammad, 2014) , In the process of muscle rehabilitation, and that the person undergoing the massage process, as much as he relaxes, will get rid of tension and benefit from various massage procedures (Baakr & Others, 2007, p. 332). As muscle electrical stimulation has a great benefit in increasing muscle strength and bulk during a short period of training (Hassan, 2019, page 100), thus, muscle lengthening improved, and both confirmed (Kazar and Kazem, 2020, page 18) , the electrical stimulation accelerated the process of returning to training and competition.

Conclusions and Recommendations:

The device designed by the researchers, which contained stimulation and electrical massage of the

muscles, showed positive effects in muscle lengthening. The researchers recommend using stimulation and electrical massage for the affected muscles, in addition to using the test used in the research through repeated tests, as well as conducting studies on games, samples and other levels.

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