



A COMPARATIVE ANALYTICAL STUDY OF THE ANTERIOR MUSCLES OF TWO LEGS AFTER ONE OF THEM SUFFERED A TEAR IN THE TWIN MUSCLE OF FOOTBALL PLAYERS EXPERIMENTAL RESEARCH ON A SAMPLE OF SPORTS INJURIES FOR THE APPLICANT CATEGORY

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Abstract

The aim of the study was to identify the strength of electrical activity of the muscles of the front legs when suffering from a twin muscle tear in advanced soccer players, and to determine the differences in comparing the injured leg with a healthy one. The researchers adopted the experimental method with a one-group comparative method. The sample was deliberately selected from the players of Basra Governorate Football Clubs, and consisted of (8) injured players who were homogeneous in physical and training measurements, after excluding (6) players for medical reasons and participating in the reconnaissance experiment. The research was conducted in the Physiotherapy Laboratory at the Faculty of Physical Education - University of Basra, for the period from February 26, 2023 to April 15, 2023. Research tools: French Electrical Muscle Activity Measurement (EMG), Gel Testing Humidifier, Height Measurement Restameter, and Medical Scale. Statistical methods: Data were processed by statistical package (SPSS) using arithmetic media, standard deviations, coefficient of difference, and T-test for independent samples. The most important conclusions are that there are significant differences in the strength of electrical activity of the muscles of the front legs between the injured and healthy legs and in favor of the healthy leg. The rupture of the twin muscle leads to a sharp decline and a significant loss of the efficiency of the muscular electrical activity of the affected leg compared to the healthy one as a result of muscle destruction and impaired neuromotor function. The EMG device has proven high accuracy and outstanding laboratory diagnostic capability in determining the level of injury severity and accurately comparing changes. The most important recommendations: the need to rely on accurate laboratory tests such as an EMG device to determine the extent of the muscle damage, and not to allow players to return to the stadiums without integrated rehabilitation based on scientific foundations to avoid the tear turning into a chronic injury.

Keywords: Twin muscle, Electrical activity (EMG), Leg muscle tear, Soccer players.

Introduction

In the investigation, the prevention, treatment, and eradication of sports injuries underscore the pivotal role of sports medicine, particularly as it becomes imperative to examine and address injuries sustained during athletic endeavours. These activities subject the musculoskeletal system, including muscle groups, cartilage, and ligaments, to significant strain, especially in pursuits demanding strength, speed, and direct confrontation with opponents, which can result in limb injuries. The lower region exhibits a significant proportion of total injuries



due to quick movement, abrupt twisting, and spasms resulting from such actions. Seventy-five percent of sports injuries were identified as muscle bruises, joint dislocations, tears, and muscle tendon tears, while twenty-five percent comprised fractures and tears of ligaments and cartilage. Lower limb injuries constituted sixty-one percent of the total, upper limb injuries accounted for twenty-two percent, head injuries represented eleven percent, and back injuries made up six percent (Osama Riyad, 1985). The injury arises from persistent friction with the opponent and continual alterations in body position, particularly during rapid movements aimed at deception and relocation, as well as variations in terrain and equipment. These factors contribute to the likelihood of injury, compounded by the exertion experienced during competition, which hinders the athlete's advancement. Additionally, the lack of a medical professional present during training or competitions to provide immediate intervention exacerbates the situation. The potential for damage exists during both training and competition, necessitating an understanding of appropriate conduct. Thus, the significance of research was demonstrated through an analytical examination of the leg muscles following an injury involving a tear of the gastrocnemius muscle, aimed at assessing the extent of changes and discrepancies between the healthy and injured limbs. The researchers contend that this issue merits thorough investigation and consideration.

Research Problem

Inadequate performance results in the power axis straying from its intended trajectory, leading to injury. Executing complex movements necessitates significant intensity and repetition. Additionally, the inappropriate flooring of stadiums and sports halls, along with substandard sports equipment and supplies, contributes to lower limb injuries, affecting joints, muscles, and other components. It is erroneous for an athlete to resume play post-injury without proper rehabilitation, as ongoing training and competition may exacerbate complications, potentially masking pain despite the existing injury. The researcher observed that the absence of precise laboratory tests assessing the extent of damage and muscle weakness resulting from the injury, along with the lack of validation of injury severity through metabolic processes, prompted the researchers to consider that certain therapeutic medical devices may enhance the rehabilitation of injuries in football players. In the event of a twin muscle tear, efforts are made to prepare the athlete utilising a scientific approach for the treatment of the injury, which, if neglected, may result in chronic acute complications and prolonged absence from the field.

Research Objectives

1. Identifying the strength of electrical activity of the muscles of the front legs when suffering from a tear of the twin muscle in football players
2. Identifying the differences in the strength of electrical activity of the muscles of the front legs when suffering a tear of the twin muscle in football players.

Research Hypotheses

1. The existence of significant differences with statistical significance in the strength of electrical activity of the muscles of the front legs when suffering a tear of the twin muscle of soccer players.

Research Areas

Human Area: The research sample is a group of players from Basra Football Governorate with a torn twin muscle.

Spatial Area: Physiotherapy Laboratory. Faculty of Physical Education and Sport Sciences at the University of Basra

1-5-3 Temporal Area: From 26/2/2023 to 15/4/2023

Methodology

Research Methodology



The researchers employed the experimental method tailored to the specific nature of the problem at hand to attain scientific and objective facts. Consequently, it was imperative to select the appropriate methodology for the research, which involves controlling all variables and fundamental factors except for one, which the researcher modifies to ascertain and quantify its effect on the process. This represents the most effective approach to problem-solving in a practical context (Ahmed Badr: 18973).

Research Sample

The research sample comprised eight (8) injured players selected from a total of fourteen (14) injured players, employing a deliberate method and experimental design with a single group, utilising pre- and post-tests. During this period, the count of athletes with bilateral muscle tears reached fourteen (14), prompting the researchers to exclude several sample members due to their injuries. Individuals with recurrent injuries or additional injuries alongside the bilateral muscle injury, which included damage to the ankle ligaments and wrist of the foot, as well as the presence of a haematoma in the ankle joint and joint stiffness, numbered two. Four participants in the exploratory experiment were excluded, with the research sample comprising solely practitioners of football.

Analysis of the work of the research sample

To ensure the homogeneity of the research sample and the accuracy of the natural distribution among its members, the researchers employed the coefficient of variation for the results of the field survey concerning biological age, training age, height, and weight. The coefficient of variation for the research sample ranged from 0.04% to 0.15%, indicating homogeneity and a favourable distribution of the sample, as the values of the coefficient of variation are confined within the range of -0.04. The research sample had a coefficient of variation of 0.15%, which is favourable, as a high coefficient of variation is indicated when values approach 1%. Conversely, if it surpasses 30%, the sample is deemed heterogeneous (Wadih Yassin Muhammad Al-Tikriti and Hassan Muhammad Abdul Obaidi: 1999). As illustrated in Table (1).

Table 1: Shows the arithmetic media, standard deviations, and coefficient values of the research sample before conducting the tests in the variables of biological age, training age, and physical measurements (height – weight).

Variables	Unit	M	SD	Parameter %
Age	Measurement	27.12	1.64	0.06
Training Age	Year	7.75	1.16	0.15
Length	Year	175.25	7.06	0.04
Weight	Poison	71.75	9.89	0.14

Means, devices and tools used in research

Means of collecting information

1. Arab and foreign sources.
2. Questionnaire for the opinions of experts and specialists in the field of (sports medicine, physiology, orthopedics, fractures, joints, physical therapy, sports training, physical fitness, tests and measurement)
3. The Information Network (Internet).
4. Email and correspondence.
5. Assistant work staff.
6. Personal interviews.

Devices and tools used in the research

The researchers used devices and tools in their research experiment, tests and tests to reach a solution to their research problem, as follows:

1. EMG device measuring the strength of muscle activity (French origin).



2. Measuring the length (restameter).
3. To measure weight (medical scale device of Italian origin).
4. HP computer and its accessories.
5. Adhesive colored medical tapes.
6. Sports terrace.

Identifying Research Variables

Testing the electrical activity of the anterior leg muscle (using an EMG device)

Purpose of the test: Measure the electrical activity force of the leg muscle

Tools used: A French-originated EMG device, a computer and a station.

Test Description: Following the application of the test moisturiser (gel) to enhance conductivity, the therapist affixes the electrodes of the electromyography (EMG) device around the anterior aspect of the patient's lower leg. The electrodes are secured to the leg muscle, and upon signal activation, the device elicits maximal contractile force from the patient, countered by the therapist's resistance in the direction of contraction. Subsequently, the data is displayed on the device's screen, and the conclusion of the test is indicated upon the completion of the readings.

Recording: When pressing the special button, the reading appears, which records the results in the form of six readings in two groups, three readings for each group on the screen of the device, then the electrodes are lifted from the affected leg and the process is repeated for the healthy leg and gets up from the bed and the infected sample is examined in the same way.

Exploratory Experiment

The exploratory experiment is a preliminary study conducted by the researcher on a small sample prior to the main research, aimed at selecting research methods (Arabic Language Academy, 1984). The researchers performed their exploratory experiment on Tuesday, 14/3/2023, involving four athletes with a twin muscle tear who are part of the sample but did not participate in the main experiment. The objectives were to calibrate the medical and laboratory measuring devices utilised in the research, identify the mechanism, and verify its validity and diagnostic capability to address errors and assess the efficiency of the work team.

Honesty

Experts and specialists concurred on the validity of the tests to assess their intended measurements, having reviewed them without any modifications, therefore deeming the tests to be reliable. An honest test accurately assesses the specific criteria for which it was designed, achieving its intended objectives (Raysan Khraibat Majeed, 1987). Furthermore, a test is deemed honest if it is evaluated by a panel of experts and effectively measures its designated parameters. (Mustafa Mahmoud et al., 1990, and subsequently discovering self-honesty) Self-honesty equates to constancy." (Mustafa Hassan Bahi: 1999)

Stability

The test that yields consistent or identical results when administered multiple times under identical conditions is referred to as the static test (Raysan Khraibat Majeed, 1987). By conducting and repeating the test, stability was assessed on four athletes with twin muscle ruptures from the research sample five days after the initial test.

Objectivity

The researchers performed a statistical analysis based on the assessors' results regarding the validity of the exams. A quality assessment is defined by its objectivity, wherein an objective test yields consistent results regardless of the evaluators involved. Consequently, the outcomes remain unaffected by the subjectivity or personality of the assessors, ensuring that the examinee receives a uniform score even when multiple evaluators grade the test (Raysan Khraibat Majeed, 1987).



Field Procedures

Search Tests

After identifying the members of the research sample, the two researchers performed the leg muscle electrolysis test by an EMG device for the group tested for the period from 22/3/2023 to 23/3/2023

Statistical Methods

The data obtained by the researchers were processed using the following statistical methods:

- ❖ Arithmetic mean.
- ❖ Standard deviation.
- ❖ Relative Difference Coefficient (Marwan Abdel Majeed Ibrahim: 2000)
- ❖ Percentage
- ❖ Testing (T) for independent samples.
- ❖ SPSS VER11 The data were processed in the statistical package (

Results

Viewing, analyzing, and discussing the results

The researchers displayed their findings in a tabular format, serving as an illustrative representation of the results to ascertain their accuracy and alignment with the objectives and hypotheses. This approach aims "to minimise the likelihood of errors in subsequent phases, and to bolster the scientific evidence and its robustness" (Rudy Schettimlir: 1974), followed by analysis and discussion.

Trauma and analysis of the results of the Activity and Electrical Test of the Muscles of the Foreleg:

Table 2: The arithmetic mean, standard deviation, and (t) value of the electrical tests show the injured and healthy leg muscles.

Variables	Injured foot		Healthy Foot		T	Sig
	M	SD	M	SD		
Muscle /1	108.3	2.87	482.3	3.03	346.0	0.000
Muscle /2	210.2	6.29	241.8	6.37	12.7	0.000
Muscle /3	222.7	4.79	236.2	3.86	14.2	0.000

Table (2) presents the electromuscular test results for the injured foot, with arithmetic medians of 108.37, 210.20, and 222.7, and standard deviations of 2.87, 6.29, and 4.79. In contrast, the arithmetic medians for the healthy foot were 482.34, 241.84, and 236.2, accompanied by standard deviations of 3.03, 6.37, and 3.86. The calculated values of (v) were 346.09, 12.70, and 14.2, with a significant p-value of 0.00, indicating statistically significant differences favouring the post-tests.

Discussion of the results of the electromuscular test:-

The motor nerve signal strength can be quantified using an EMG device, as muscle contraction represents a rapid alteration in the electrical state of the muscle. This change in voltage during movement and contraction is depicted in the EMG recording as a line that ascends and subsequently returns to its baseline following the muscle cell's restoration to its normal state, reflecting both wavelength and frequency (Abul Ela Ahmed Abdel Fattah, 1997). Furthermore, the force generated during muscle hypertrophy that enhances muscular strength (Risan Khrabet, 1987). The researchers in Table (2) assert that the notable differences and substantial impact of the anterior muscles in the injured leg, as opposed to the healthy leg, stem from the compromised strength of the injured muscles, the diminished recruitment of motor units for muscle activation, and subsequent atrophy. These factors contribute to lethargy in the nervous system and hinder the increase in baseline activity, ultimately resulting in neurological incompatibility and diminished performance. Nervousness can inhibit the mobilisation of the maximum number of motor units due to injury, resulting in a lack of contraction during exertion. This phenomenon is referred to as reserve force, which can be activated



through maximal neural stimulation. In specific circumstances, such as fear, this activation may also be induced through training. Consequently, the greater the number of motor units engaged in contraction, the higher the resultant muscle strength (Abul Ela Ahmed Abdel Fattah, 1997). The research findings validated the substantial differences in muscle electrolysis measurements and elevated wavelength index readings, indicating an enhancement in the nervous system's capacity to innervate a greater number of motor units for optimal contraction, contingent upon the resistance faced by the muscle. "Motor units may participate in muscle contraction" (Abul Ela Ahmed Abdel Fattah, 1997). The mobilisation of motor units in muscular work progresses from small to large, contingent upon the type of load applied. This process is governed by neuromuscular compatibility within the muscle, as the magnitude of muscular force correlates with the nervous system's capacity to stimulate motor units for maximal contraction. To surmount the load's resistance, muscular strength development progresses from zero to maximum by initially engaging smaller motor units for contraction, followed by the recruitment of larger and faster units (Abul Ela Ahmed Abdel Fattah, 1997).

Conclusions

1. The existence of significant differences with statistical significance in the strength of electrical activity of the muscles of the front legs when suffering from a tear in the twin muscle of football players.
2. The results showed the extent of weakness and atrophy in the muscle groups working in the legs, as well as limitation of movement, due to the muscles surrounding the affected joint being affected by the rupture of the twin muscle.

Recommendations

1. The necessity of using measurements and devices used and others not used in the research for muscle groups under research and other groups to support and study the injury of other muscles in the joints of the body.
2. The researchers recommend the necessity of using the EMG device in the treatment and rehabilitation centers of the specialized cadres before and after the operation to give it the optimal degree of injury.
3. Emphasizing the health cultural awareness in the sports environment and quick review in case of injury to the occurrence of complications of the injury to the muscle groups.

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