

# EFFECT OF A REHABILITATIVE EXERCISES PROGRAM WITH USING THERAPEUTIC MASSAGE, AND ELECTRICAL STIMULATION TO RESTORE THE EFFICIENCY OF ROTARY CUFF MUSCLES OF THE SHOULDER JOINT FOR JUNIORS DOLPHIN SWIMMERS

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## Abstract

The research aims to identify the effect of Rehabilitation Exercises Program With Use of Therapeutic Massage, Electrical Stimulation to Restore the Efficiency of the Rotator Cuff Muscles of the Shoulder Joint for Dolphin Swimmers, and this is achieved through the following subobjectives: Developing the muscle strength of the muscle groups working on the shoulder joint, improving the flexibility of the shoulder joint by increasing the range of motion in the positive direction (flexion and extension), reducing the degree of pain caused by inflammation of the shoulder joint, The experimental method was used in the experimental design of one group by applying Pre and Post measurements, and the research sample was chosen intentionally from young dolphins swimming with pain in the shoulder joint in Dakahlia Governorate, and those who frequented the fitness centers At Mansoura Sports Stadium, numbering (10) juniors and their ages range from 10 Between (13-15) years old and registered in Egyptian Swimming Federation for the 2021/2022 training season, Homogeneity was performed on the research sample in the basic measurements (age, height, weight, training age, arm length, shoulder width, body mass index), as well as homogeneity in the variables of muscle strength, shoulder joint flexibility and pain degree for the sample under investigation, The most important results indicated that the rehabilitation exercise program that includes strength and flexibility training with the use of therapeutic massage and the proposed electrical stimulation led to the development of balanced muscle strength of the working (motor) and opposite (reverse) muscles near the affected shoulder joint, as well as increasing the range of motion of the shoulder joint for dolphin swimmers in It also helped reduce the sensation of pain in the affected shoulder joint, and restore the relative recovery of the rotator muscles affected by inflammation in the shoulder joint of dolphin swimmers , The researchers recommend the need to educate injured swimmers to undergo rehabilitation sports programs after injury, as it helps them to return quickly to practice specialized sports activity as soon as possible and at a level close to their level before the injury .

**Keywords:** Rehabilitative Exercise Program, Therapeutic Massage, Electrical Stimulation, Shoulder Joint, Dolphin Swimming Juniors.

## Introduction

The rate of prevalence of injuries in sports activity has become a phenomenon that attracts the attention of all workers in this field, despite the scientific progress that the world is witnessing in recent times in various medical sciences, the adoption of modern methods in sports treatment and rehabilitation, the use of the latest equipment, and the provision of specialists from doctors and injury specialists. However, sports injuries are still widespread in a way that threatens the level of performance and the continuation of swimming in practice. [1]

As R. Crevenna indicated, every 10,000 physical sports practitioners are injured during one training year, approximately 47%, regardless of the type of injury and the extent of its impact on keeping the athlete from practicing his activity for a long or short period.[2]

Dalla Pria, Nuno Tavares, and others agree that the cause of sports injuries may be excessive enthusiasm on the part of swimmers, increased sports training load, intense competition, high level of athletic achievement, trying to win advanced positions at different sports levels, and being under constant pressure during competition, increasing the possibility of sports injuries of different types and severity. [3]

As G. Davies, De Martino, and Gao see that injuries are considered one of the most important problems that players face during sports activity practice, as they are considered one of the basic obstacles that lead to a decrease in the player's physical and skill level and hinder the player from continuing training, which may cause him, even after the completion of recovery, deficient performance and incomplete skill, as well as reduce the level of skillful performance due to lack of training for long periods, and many athletes fail to restore the full function of the injured part, leading to depriving the player of practicing sports activity Temporarily, or it may be final due to failure or delay in rehabilitation followed after the injury. [4-6].

In this regard, I. Gapharov states that therapeutic rehabilitative exercises are one of the basic natural means in the field of integrated treatment for sports injuries and that sports therapy is of particular importance in the field of sports rehabilitation, as it works to increase the rate of muscle healing and helps to quickly get rid of clusters. And blood accumulation, it also helps to stop the bleeding and works to quickly restore the injured muscles and joints to their functions in the shortest possible time because the muscles after undergoing the exercises will be able to reduce the stress on them and prevent the emergence of pain, and this, in turn, paves the way for preparing the injured player to practice specialized activities and his return to the stadiums after recovery The basic functions of the injured player's organ, as the process of sports motor rehabilitation and treatment depends on exercises of all kinds.[7]

Q. Gasibat adds that the rehabilitation exercises are divided into (negative exercises), which are the first stages of rehabilitation to activate the injured member and are accompanied by the use of physical therapy means, and (assisted exercises), where the therapist assists the injured in moving the affected part, and (free positive exercises). which are free exercises performed in the direction of gravity, and (resistance exercises) are exercises performed by the injured person to gain strength using all types of resistance, and A. Ibrahim states that they are generally performed outside or inside the water.[8, 9]

George Davies and others mention that the shoulder joint is considered one of the most affected areas in swimmers, given that it bears the greatest burden, as these frequent complaints of shoulder pain were called "swimmer's shoulder" without specific reference to the causes and mechanisms of pain. Knowing the causes of these recurring pains can help doctors, rehabilitation specialists, and trainers develop rehabilitation strategies and reduce these recurring pains.[4]

Monica Tesoro et al, reported that the prevalence of shoulder joint injury among swimmers is since it has multiple axes of movement in different and wide directions, and this makes it at the same time more vulnerable to injuries and a high rate, compared to other joints of the body, when performing difficult, complex or repetitive movements, and the injury constitutes great pressure. It affects the muscles, tendons, and ligaments surrounding the shoulder joint. Swimming is a competitive sport that requires swimmers to put in more effort.[10]

Ivan De Martino and others agree that the rotary muscles of swimmers are exposed to high and repeated training loads, which causes many problems in this. The muscles range from mere fatigue and exhaustion to a lack of

blood circulation, which in turn leads to damage and erosion of the collagen connective tissue (Collagen Failure). Some sports cause pain and a defect in shoulder function, such as throwing, throwing, punching, volleyball, swimming, and water polo. The injury occurs as a result of exhaustion and fatigue resulting from high loads in these sports on the rotary muscles. In addition, paralysis may occur in the nerve supplying the bone of the plate, which leads to the cessation of the movement of these muscles if not rehabilitated.[5]

M. F. IMJALLI, states that if we look at the anatomical structure of the shoulder joint, we find that the stability and integrity of the joint rest to a large extent on the ligaments, tendons, and supportive, and stabilizing muscles that surround it as pivotal belt encircling the shoulder and protecting it from separation from the cavity in which it rests. (The head of the humerus bone), the multidirectional movements of different importance and interconnected with other joints of the upper limb such as the clavicle bone and the scapula bone explain the function performed by this joint as an important member of the active body members in the locomotor system with the rest of the joints of the upper limb. [11]

### Research problem:

R. Irina, indicates that dolphin swimming is one of the most important types of competitive water sports that use the water medium as a means of movement, by moving the arms, torso, and legs harmoniously, to improve the physical, skill, and numerical capabilities of the swimmers.[12]

In this regard, M. Krastanova, D. A. Maheswari, and S. Masiero note that the nature of dolphin swimming training requires swimmers to cut daily during training from 10 to 14 kilometers per day, equivalent to 2500 arm cycles around the shoulder joint, and this physical effort continues. From 6-7 days a week, bringing the number of cycles around this joint to 16,000 cycles per week, which represents about 65% of the swimmer's driving force during the dolphin swim. These repetitive movements of the arms make the shoulder joint more vulnerable to injury, in addition to the fact that more frequent exposure of swimmers to minor injuries and neglecting them makes the shoulder joint more susceptible to a major injury in this type of swimming.[13-15]

S. Matsumoto, explain that the shoulder joint is one of the joints most susceptible to injury, especially in sports activities such as swimming, handball, volleyball, and water polo, because it is the only joint that allows 360-degree rotation, as it is the most flexible joint in the body, which increases the chances of injury to the nature of its structure that puts it in a state Lack of stability, and Paolo Dalla Pria adds that the nature of the mechanical performance of the movements of the shoulder and arms in these sports depends largely on the movements of the upper limb, and with the length of the training or competition period, the chance of injury increases.[16]

Klaus Buck mentions that shoulder joint injury are still widely spread among swimmers, which may negatively affect performance levels, as these injuries stand in the way of achieving all the desired goals that swimmers and coaches alike seek to achieve in all areas of different sports competitions. [17]

Yuiko Matsuura and others confirm that shoulder joint injuries rank second directly in terms of recurrence and complaints after knee joint injuries, and juniors are more susceptible to the occurrence and recurrence of shoulder joint injuries than adults, as they appear frequently and continuously in sports in which performance requires repetitive movements of the arm. Overhead swimming like a dolphin.[18]

Y. Matsuura, adds that the shoulder joint injuries that occur during sports activity may occur from frequent and excessive use for long periods in any sporting activity that requires continuous movement of the arm, as these movements may cause pressure on the soft and soft tissues that surround the joint.[18]

In this regard, Monica Tessaro and others mention that sports rehabilitation aims to restore swimmers to their ability and abilities to return to participate in the activity again strongly and soundly, and the treatment and rehabilitation process depends on the use of all types of physical exercises, along with some assistive devices and tools to complete treatment and rehabilitation [10].

Jae Hyun Jeon and Jin Oh Kim explained that it is possible to develop muscle strength and increase the muscle size of the shoulder joint by using electrical stimulation, as the electrical impulses sent by the device disperse the

pain signals sent by the nerves in the sore areas, so the patient's sense of this pain decreases, as she confirmed. Muhammad Nasr El-Din Radwan that therapeutic massage reduces muscle tension, increases relaxation, relieves pain, muscle soreness, and tension, improves blood circulation by increasing the amount of blood supplied to the muscles, lowers heart rate and blood pressure, and improves the functions of the immune system.[19]

E. M. Medica believes that the shoulder joint performs functional tasks while performing life and sports movements, as an injury (muscle, ligament, or nerve) that works on the shoulder joint affects its motor function, and the natural movement of the joint stops, leading to poor blood circulation. In the region, the ligaments of the joints are subjected to contraction and stiffness, and the condition is accompanied by damage, deficiency, and atrophy in the muscles and tendons, a decrease in muscle strength, and a decrease in flexibility. Movement is limited with the appearance of severe pain attacks upon movement, and even without it in some cases.[20]

In this regard, the researcher believes that the injury of the shoulder joint is one of the injuries that most affect the sport of swimming, and therefore the delay in recovery from that injury or the wrong treatment for it may negatively affect the level of swimmers and their continuity in performance and practice for a longer period, as many swimmers may suffer from lacerations and infections accompanied by pain in the muscles of the shoulder joint, especially the rotator muscles, due to their frequent use during the performance of dolphin swimming, but they still practice dolphin swimming despite the presence of problems and pain in the shoulder joint, so it is necessary to pay attention to rehabilitating the shoulder joint in general by strengthening the tendons and muscles working on the shoulder joint. This prompted the researchers to carry out this research as a scientific attempt to design a rehabilitative exercise program with the use of therapeutic massage and electrical stimulation because of their advantages and positives in the rehabilitation process and improving the muscle strength of the muscles working on the shoulder joint as well as the range of motion of the shoulder joint and alleviating joint pain, to restore the efficiency of rotary muscles Shoulder joint injured dolphin swimmers.

### Importance of research:

The importance of this research is due to the following.

- 1- It is a scientific and practical attempt by the researcher to build a suggested rehabilitation program with the use of therapeutic massage and electrical stimulation to eliminate shoulder joint infections and develop the ability of the shoulder joint in terms of the range of motion and muscle strength of the rotary muscles in particular and to strengthen the shoulder, pectoral and plank muscles in general, to achieve the best results in sports competitions.
- 2- Treatment of shoulder joint infections in a different way and rehabilitation tools from previous studies conducted, which gives weight to the research because it serves a broad base of swimming professionals.
- 3- Researchers can employ this program in cases similar to other sports to shorten the rehabilitation time and return the players faster to practice their specialized activity with the same physical and functional efficiency before the injury or as close to it as it is a broad base upon which researchers in the future rely to develop rehabilitation programs for the shoulder joint.

### Research aims:

The research aims to identify the "**Effect of a Rehabilitative Exercises Program with Using Therapeutic Massage, Electrical Stimulation to Restore the Efficiency of Rotary Cuff Muscles of the Shoulder Joint for Juniors Dolphin Swimmers**", and this is achieved through the following sub-objectives:

- 1- Designing a rehabilitation program using a group of Therapeutic Exercises with acupressure (superficial and deep) in addition to electrical stimulation with a Tens device to restore the efficiency of rotary muscles affected by the shoulder joint for dolphin swimmers.
- 2- Developing the muscle strength of the muscle groups working on the shoulder joint.

3- Improve shoulder joint flexibility by increasing the range of motion in the positive direction (flexion and extension) direction.

4- Reduce the degree of pain caused by shoulder joint infections.

5- Identify the percentage of improvement resulting after applying for the qualifying program for all research variables.

### Research hypotheses:

1- There are statistically significant differences and improvement rates between the means of the pre-and post-measurements for the experimental group in the muscular strength of the muscles working on the shoulder joint to restore the efficiency of the rotary muscles affected in the shoulder joint of the dolphin swimmers in favor of the averages of the post measurements.

2- There are statistically significant differences and improvement rates between the means of the pre-and post-measurements for the experimental group in the Increased range of motion for the flexibility of the shoulder joint Direction (bend and tide) Positive to restore the efficiency of the rotary muscles injured in the shoulder joint of the dolphin swimming juniors in favor of the means of the post measurements.

3- There are statistically significant differences and improvement rates between the means of the pre-and post-measurements for the experimental group in Reducing the degree of pain resulting from shoulder joint infections to restore the efficiency of the rotary muscles affected in the shoulder joint for dolphin swimming juniors in favor of the means of the post measurements.

### Research Terminology:

- **Rehabilitation Exercises:** One of the methods of physical kinetic sports therapy is to employ measured movements aimed in the form of various exercises to restore the basic functional ability of the injured member and physically rehabilitate him to return efficiently to sports activity in the shortest possible time using physical therapy methods that are appropriate for the type and severity of the injury.

- **Therapeutic Massage:** It is the art of dealing with the soft tissues of the body directly using the hands or by alternative means in light of the anatomical facts and the extent that the joint allows for movement, in a scientific and standardized manner to improve the functions, systems, and organs of the various body and rid it of the effects of fatigue, exhaustion, injuries, and some diseases. Others, whether for athletes or others.

- **Electrical stimulation:** It is the use of electric current resulting from a device to stimulate the nerves for therapeutic purposes, by placing the electrodes of the electrical stimulation device for the nerve through the skin, to stimulate the muscle fibers to contract, as the nervous system in the event of injury and pain is unable to produce such intensity High muscle contraction, which increases both the amplitude and speed of its electrical response.

- **Rotator cuff muscles of the shoulder joint:** an anatomical term given to the group of four muscles and their tendons that work to stabilize the shoulder joint, namely (the deltoid muscle, the square trapezes muscle, the supraspinatus muscle, the infraspinatus muscle, the Teres minor, subscapularis muscle (procedural definition).

### Previous studies:

Research by **John Bradley et al., 2016** titled "A Review of Shoulder Injuries and Problems Among Competitive Swimmers", This study aims to focus on shoulder problems among swimmers and provides a review of factors that may expose swimmers to injury. To achieve this, the EBCSO host research database was initially searched using the words Main: (swimmers or swimmers), (competitive or shoulder), and (injury or pain), these were

supplemented by cross-referencing the publications cited by the research authors, and effect sizes (Cohen's d) were calculated to compare different factors associated with a shoulder injury. The researchers used the descriptive survey method to review the literature, where the factors associated with shoulder problems were divided into six groups: (shoulder biomechanics, general characteristics of the swimmer; history of injury, shoulder laxity, range of motion, shoulder strength, general strength). Discussing the results, it showed the following: The most common problems that swimmers face are the emergence of infections and pain in the shoulder joint and tendons, followed by muscle rupture, then shoulder dislocation, as a result of competing swimmers spending a long time training for their sport, as they can swim. Swimming 110 km or more per week As a result of this amount of swimming and the repetitive nature of arm strokes, swimmers can develop shoulder injuries.[21]

Research by **Karoly Torres et al.,2021** titled "Swimmer's Shoulder Injury and its Relation to the Range of Movement Among Young Swimmers", The research aims to determine the prevalence of shoulder injuries among competitive swimmers at an early age. The research sample was selected from 304 Hungarian swimmers, divided into (164 males and 140 females) and their ages ranged from 11-13. The descriptive approach was used. The research tools consisted of questionnaires on swimming training methods (weekly training hours, rotation angle and shoulder height, muscle strength ratio, rotator cuff muscle, muscle diseases biceps brachii) and the extent of shoulder pain, in addition to conducting physical examinations. The most important results indicated that 30% of young swimmers reported shoulder pain, and the common risk factors were: decreased height and internal rotation, increased external rotation, and imbalance in The strength of the rotational muscles, in addition to that there was a significant decrease in the height of the left subscapular region ( $176^{\circ}$ - $179^{\circ}$ ), the teres minor ( $177^{\circ}$ - $179^{\circ}$ ) and the right teres muscle ( $176^{\circ}$ - $179^{\circ}$ ), and research is recommended to improve flexibility and range of motion And the muscular balance of the shoulder muscles, and this can only be achieved by performing regular and appropriate stretching exercises, which can play a big role in preventing swimmer's shoulder injury.[22]

Research by **Yuiko Matsuura et al.,2022** titled "Muscular Compatibility for Butterfly Arm Strokes: A Comparison of the History of Shoulder Pain While Swimming", The research aimed to find out the differences in the level of muscular compatibility between swimmers who had a history of shoulder injuries and returned to swimming again, and among healthy swimmers. The descriptive approach was used, and the research sample included (20) butterfly swimmers, who were divided into a control group of (8) healthy swimmers, and an experimental group of (12) swimmers with a history of shoulder joint injuries. The research tools consisted of analyzing four axes of muscle compatibility (at the early withdrawal of the arms to the water with the movement of the head, at the main withdrawal of the arms with the movement of the middle inside the water, when the arms out of the water with the movement of the legs, the ability to recover) for both groups of young swimmers using electromyography (EMG) and showed. The most important results are that the contribution of the working muscles on the shoulder joint, which participate in the muscular work of the shoulder joint, is low during the early pull-up compared to the control group. Good agreement between the upper limbs and the abdominal muscles in the early stretch phase of butterfly swimmers.[18]

## Research Methods and Procedures

### Research Methodology:

The researcher used the experimental approach for one experimental group using the experimental design of the pre-and post-measurements due to their suitability to the nature and objectives of the research.

### Research sample:

The research sample was chosen by the intentional method from the dolphin swimmers who suffer from pain in the shoulder joint in Dakahlia Governorate, and who frequent the fitness centers in the Mansoura Sports Stadium.

2022 AD, in addition to an exploratory sample from outside the basic research sample, which consists of (6) junior swimmers to conduct exploratory studies on them. The reasons for choosing the research sample are as follows:

- All members of the sample of young dolphin swimmers registered with the Egyptian Swimming Federation for the 2012/2021 season, who was diagnosed after X-rays by specialized doctors with pain in the rotary muscle groups of the right shoulder joint.
- All respondents had not previously undergone physiotherapy or rehabilitation programs to treat shoulder joint pain.
- That the sample members be healthy by conducting an apparent medical examination on them, and that they are free from any other chronic diseases, in addition to that they do not suffer from other injuries that affect the results of the research.
- The presence of a suitable stadium and fitness center with the capabilities and tools necessary to implement the proposed program at the Mansoura Sports Stadium.
- The consent of the sample to implement the rehabilitation program proposed to them by their will and desire at the specified times and places in addition to undergoing the tests specified by the researchers, and the regularity of all the sample members to apply the research experience to them.

#### **Moderation of the distribution of the research sample:**

Homogenization was conducted for the research sample to ensure that all variables that can affect the results of the investigation were controlled, and this is evident in Tables (1) (2):

Table (1)The mean, standard deviation, and skewness of torsion in the basic measurements of the sample study n=16

<b>Variables.</b>	<b>Unit</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>	<b>Kurtosis</b>	<b>skewness</b>	
Anthropometric measurements	Age	Year	14.58	0.541	14.55	-0.348	-0.429
	Height	cm	165.4	1.927	165.5	-1.105	-0.102
	Weight	kg	62.37	1.543	62	0.819	0.516
	Training Age	Year	4.3	0.412	4.25	-0.846	-0.26
Arm length	cm	65.18	1.973	66	-0.074	-0.832	
Shoulder width	cm	42.62	2.334	42.5	0.672	0.412	
BMI	kg/m2	22.8	0.483	22.72	1.26	0.503	

It is clear from Table (1) that all the skewness coefficients for the research sample ranged between (-0.832: 0.516) and that these values were confined to  $\pm 3$ , which confirms the homogeneity of the sample and the absence of data defects from nonnormal distributions in the variables under study.

#### **Moderate distribution of the variable of muscle strength and flexibility of the shoulder joint:**

Table (2) The mean, standard deviation, and skewness of torsion in the variables of muscular strength and shoulder joint flexibility, and degree of pain for the sample study n=16

Variables of muscle strength, flexibility, and degree of pain		Unit	Mean	SD	Median	Kurtosis	skewness	
muscular strength	Measure the grip strength of the affected arm	kg.	26.1	1.523	26	0.042	0.735	
	Pressing weights from horizontally lying	kg	55.8	2.973	55.5	0.071	0.052	
	Press the weights high in front of the neck	kg	48.4	4.325	47.5	-1.477	0.349	
	Press the weights high from behind the neck	kg	44.1	2.601	44.5	-0.944	-0.136	
	Stability with the arms parallel	Sec	20.7	2.75	20.5	-1.314	0.231	
	Attachment to the horizontal bar	Sec	24.9	2.024	25	0.34	-0.434	
	Throwing a medicine ball with the arms back over the head	meter	5.38	0.496	5.4	-0.712	0.017	
	Throws a medicine ball with the arms behind the back	meter	2.45	0.319	2.51	-1.22	-0.11	
Shoulder joint flexibility	The range of motion of the shoulder joint in the tide direction		cm	22.7	2.057	22.5	-1.083	0.121
	The range of motion of the shoulder joint in the direction of flexion		cm	45.4	2.319	45.5	-0.629	-0.142
	Geometric shoulder joint angle measurement	Raise the injured arm high from standing	degree	191.1	2.282	192	-0.74	-0.723
		Raise the injured arm behind from standing	degree	69.2	4.022	69.5	-0.625	-0.605
		Raising the injured arm aside from standing	degree	174.8	2.82	174.5	0.225	0.811
Pain score scale (VAS) Visual analog of the shoulder joint		degree	5.9	0.994	6	-0.157	-0.61	

It is clear from Table (2) that all the skewness coefficients for the research sample ranged between (-0.723: 0.811) and that these values were restricted to  $\pm 3$ , which confirms the homogeneity of the sample and the absence of data defects from nonnormal distributions in the variables under study.

### Tools and means of data collection:

Reference survey of previous studies and research:

The researcher conducted a survey study of recent Arabic and foreign research and studies, as well as looking at scientific references specialized in the rehabilitation of sports injuries related to the subject of the investigation.

To get acquainted with the working muscles and the dynamics of the work of the shoulder joint, to assist them in developing rehabilitative exercises for dolphin swimmers with shoulder joint pain to restore the efficiency of the rotary muscles affected by the joint, and also to identify devices and tools for data collection, as well as to identify the tests and measurements that It is commensurate with the objective of the study and the nature of the research sample, and is characterized by high scientific transactions.

### **Search forms:**

Basic data registration form (age, height, weight, training age, arm length, shoulder width, body mass index (BMI)).

Test registration form and measurements Variables of muscle strength, shoulder flexibility j, poi, not, and degree of pain).

### **Research tools and devices**

- device Rotameter to measure height measured (in centimeters).
- A medical scale to measure weight to the nearest (half a kilogram).
- A flexible measuring tape (barrel) to measure lengths and widths in centimeters.
- A graduated ruler to measure distances (in centimeters).
- Body composition analyzer Body composition analysis to measure body mass index.
- device dynamometer to measure Energy first estimated to the nearest (half a kilogram).
- Goniometer device to measure the estimated range of motion of the shoulder joint (degree of angle).
- alarm devise The electric tens to develop the muscle strength of the shoulder joint.
- Iron bars and legal weight discs of different weights.
- Medicine balls weighing 3 kilograms.
- Open and closed rubber bands.
- A set of other tools and devices in the club (parallel bar, bar, Swedish seat, whistle, stopwatch, Australian rubber ball for exercise).

### **Research tests and measurements used**

#### **1. Tests Muscular strength:**

- Grip strength test of the affected arm (kg)
- bench press (kg)
- Push-up test of the front neck (kg)
- Back-of-the-neck push-up test (kg)
- stability test on the parallelepiped (w)
- Horizontal hanging test (w)
- Throwing a medicine ball with the arms behind the head (meter)

- A test by throwing a medicine ball with the arms behind the back (meter).

## 2. Tests Flexibility of the shoulder joint:

- Measurement of the range of motion of the shoulder joint in the elongated direction (cm)
- Measurement of the range of motion of the shoulder joint toward flexion (cm)
- Test of raising the affected arm high from standing and measuring the angle with a goniometer (degrees)
- Test of raising the injured arm from standing and measuring the angle with a goniometer (degrees)
- Test of raising the injured arm to the side from standing and measuring the angle with a goniometer (degrees)

## 3. Scale Visual Analogue Seal:

- Visual analogy pain score (VAS) test for the shoulder joint (degrees).

### Exploratory study:

This study was conducted during the period from Saturday 7/23/2022 to Wednesday 7/27/2022, which aimed to calculate the scientific coefficients (Validity and Stability) for the variables of muscle strength, the flexibility of the shoulder joint, and the degree of pain for the sample under study, where the stability coefficient was found by applying the tests and reapplying it again (Test & Re-Test) with a time difference of five days from the first measurement at the same time and arrangement of measurements to standardize the conditions as much as possible, on a sample of the research community and outside the basic research sample, and they numbered (6 ) young dolphin swimmers with shoulder joint pain.

The Pearson correlation coefficient was used to find the correlation coefficient between the results of the first and second Trials, and the Self-Honesty Coefficient was also calculated for the tests and measurements in question by extracting the square root of the stability coefficient, as shown in the following table:

Table (3)Correlation coefficient between the first and second applications of the tests and measurements under investigation

Variables of muscle strength, flexibility, and degree of pain		Unit	1st Trial		2nd Trial		r value	Validity
			Mean	SD	Mean	SD		
Muscular Strength	Measure the grip strength of the affected arm	kg	25.83	0.752	26.33	1.032	0.857*	0.926*
	Pressing weights from horizontally lying	kg	54.84	2.786	55.5	2.588	0.845*	0.919*
	Press the weights high in front of the neck	kg	49.83	3.311	50	2.756	0.898*	0.947*
	Press the weights high from behind the neck	kg	43.66	3.141	44.83	3.488	0.888*	0.942*
	Stability with the arms parallel	Sec	19.66	2.732	21.83	2.316	0.905*	0.951*
	Attachment to the horizontal bar	Sec	24.66	2.581	25.33	1.966	0.814*	0.902*
	Throwing a medicine ball with the arms back over the head	meter	5.43	0.466	5.64	0.316	0.833*	0.913*
	Throws a medicine ball with the arms behind the back	meter	2.64	0.216	2.74	0.202	0.845*	0.919*

Shoulder joint flexibility	The range of motion of the shoulder joint in the tide's direction.		cm	22.66	2.338	23.83	1.94	0.910*	0.954*
	The range of motion of the shoulder joint toward flexion		cm	45.5	2.81	44	1.788	0.835*	0.913*
	Geometric shoulder joint angle measurement	Raise the injured arm high from a standing	degree	191.33	2.422	191.66	2.581	0.916*	0.957*
		Raise the injured arm behind from standing	degree	69.5	3.449	69.83	3.311	0.901*	0.949*
Raise the injured arm out of the way of standing		degree	174.16	2.786	174.33	3.011	0.921*	0.959*	
Pain score scale (VAS) Visual analog of the shoulder joint			degree	5.66	1.211	5.83	1.169	0.801*	0.894*

R-value at 0.05 = 0.729

It is clear from Table (3) that there is a statistically significant positive correlation at a significant level of 0.05 between each of the scores of the first and second Trails measurements of the tests and the measurements in question applied to the sample of the pilot study, where the correlation coefficient for the test ranged from (0.801 to 0.921), and the self-validity coefficient ranged (from 0.894 to 0.959), which indicates the stability and validity of the tests with the variables of muscle strength, the flexibility of the shoulder joint, and the degree of pain for the sample used under study.

### Basic study:

#### Pre-measurements:

Pre-measurements were carried out from day-to-day Thursday 7/28/2022 Until Friday 7/29/2022, to ensure the homogeneity of the research sample members in the basic variables (age, height, weight, training age, arm length, shoulder width, body mass index (BMI), And also some variables (Muscular strength, flexibility of the shoulder joint, and degree of pain). For the sample of the study, before applying for the rehabilitative exercise program with the use of therapeutic massage and the proposed electrical stimulation.

#### Suggested application of the rehabilitative exercise program:

The distance that was not confirmed The homogeneity of the research group in the variables under investigation was completed by applying a program of rehabilitation exercises with the use of therapeutic massage and electrical stimulation, to restore the efficiency of the rotary muscles affected by the shoulder joint of the dolphin swimmers, by developing muscle strength and strengthening the ligaments of the muscle groups working on the shoulder joint with improving muscle tone and creating a muscular balance for the working muscle groups and the corresponding joint. Shoulder, and improve the flexibility of the shoulder joint by increasing the range of motion in the positive (flexion and extension) direction and reducing the degree of pain resulting from infections in the shoulder joint to avoid the aggravation of the injury, from Saturday 7/30/2022 to Wednesday 10/19/2022 AD and for a period of (12) a week.

### **Principles for developing the proposed rehabilitation exercise program:**

The foundations on which the program is built and the physiological characteristics of the junior swimmer for the age group under study were studied before developing the rehabilitation exercise program so that the program is built on sound scientific foundations and rules. The following foundations have been identified as criteria for the qualifying program based on: The referenced survey and previous studies are as follows:

- The therapeutic Exercise program was applied with the use of a set of fixed and mobile exercises without tools and with tools, with the use of sweeping massage (superficial and deep) by hand and a physical therapy device (Tens for electrical stimulation) on the research sample to overcome as much as possible infections and shoulder joint pain days (Saturday, Monday, Wednesday).
- The duration of the qualifying program is (12) weeks.
- The number of qualifying units reached (3) units during one week, with (36) training units throughout the qualifying program.
- The severity of the load is medium, reaching (50: 70%) for the rehabilitative therapeutic movement exercises.
- The intensity of the training loads was rationed according to the time. And for the number of groups, times of repetition, and rest periods between, as follows, the gradual increase in the time of the qualifying unit during the total period of the rehabilitation program, so it is (45 s) in the first month, (60 s) in the second month, and (75 s) in the third month, and thus the total time is during The qualifying program period is (2160) minutes, which is equivalent to (36) qualifying hours.
- The rehabilitation unit was divided according to the objective of the unit, taking into account the installation of the warm-up and cool-down time, so that during the first month it would be (45 minutes) as follows: the introductory part (warm-up) and takes (10 minutes), the main part and it takes (30 minutes), and the final part and it takes (5 minutes). ), and during the second month (60 minutes), as follows: the introductory part (warm-up) takes (10 minutes), the main part and it is 5 minutes), the final part and it is (5 minutes), and during the third month (75 minutes), as follows: The preliminary (warm-up) part (10s), the main (60s) part, and the final (5s) part.
- Rehabilitative therapeutic exercises (45) have been developed throughout the program units for the shoulder joint, divided into (36) exercises for the flexibility of the shoulder joint and (9) weight exercises to strengthen the muscles working on the shoulder joint.
- The load cycle through the phases of the program is formed in a work-to-rest ratio (1: 1), as well as (1:2).
- The training method used is the interval (low intensity) and the rise is carried out by the gradual method.
- Taking into account the performance of flexibility exercises during the rehabilitation unit so that the increase in strength that is developed using kinetic therapeutic rehabilitation exercises does not negatively affect flexibility.
- Paying attention to warming up at the beginning of the unit, as well as cooling down at the end of each treatment unit.
- Almond oil was used to massage the shoulder of swimmers.
- The intensity of the weights used in the exercises and tests was determined by determining the maximum that can be lifted for one time, 1RM.
- The Tens Digital 2-channel Tennis Machine Model EA-F20 was used for electrical stimulation, as it was applied to relieve shoulder joint pain for dolphin swimmers who suffer from joint pain and inflammation, as well as to develop muscle strength of the muscle groups working in the shoulder joint (for the shoulder rotator cuff muscles of the shoulder ) which are (the deltoid muscle, the square trapezes muscle, the supraspinatus muscle, the infraspinatus muscle, the teres minor muscle, the subscapularis muscle), by fixing the pillows used with belts to stimulate the muscle to be strengthened. In the main part of the rehabilitation unit, the intensity of the electric

current was determined according to the degree of tolerance of the swimmers to pain, and the intensity graduated according to the time the device continued to operate, as it ranged from (5 to 10) minutes and for two months out of the time of the rehabilitation program of (3) months in separate units.

#### **Conditions that must be followed when applying for the proposed rehabilitation program:**

- Do not stress the injured swimmer while performing the kinetic therapeutic exercises.
- Graduation in kinetic therapeutic exercises from easy to difficult and from simple to complex in terms of load and intensity, taking into account the lack of access to the pain stage, to improve some physical variables (muscle strength, flexibility).
- Do not rush to perform the exercises so as not to lead to the appearance of the pain stage.
- After the massage, he takes into account the performance of short motor therapeutic exercises.
- The kinesthetic therapeutic exercises must be by the main objective of the rehabilitation program and the medical condition of the sample under study.
- Diversity in kinetic therapeutic exercises within the rehabilitation program ensures that patients do not feel bored.
- Taking into account the individual differences in the rehabilitation program and applying it individually in terms of the degree of feeling pain according to the degrees of Premeasurements taken by the researchers.
- Considering raising the morale of the injured and rehabilitating them psychologically when performing therapeutic exercises with the accompaniment of soft music during the performance and massage.
- Considering the assistance of the therapist for swimmers when needed while performing the exercises to avoid the appearance of the pain phase.

#### **Post-measurements:**

After completing the implementation of the basic research experiment directly, dimensional measurements were taken from Thursday 10/20/2022 to Friday 10/21/2022 for some variables of muscle strength, the flexibility of the shoulder joint, and the degree of pain under study, after completing the application of the program The proposed rehabilitation exercises, in the same order and time as the application of the pre-measurements.

#### **Statistical processors:**

The data for the search variables were processed using IBM Statistical Analysis Package for Social Sciences software SPSS Statistics ver.21; A significant level of 0.05 was chosen to ensure the significance of the statistical results. The statistical treatment plan included the following methods:

- Mean
- Standard Deviation
- Skewness
- Kurtosis
- Pearson correlation coefficient
- T-Test Paired

- Improvement rates by percentage

### Presentation and discussion of the results:

Presentation and discussion of the results of the first hypothesis: “There are statistically significant differences and improvement rates between the means of the pre-and post-measurements. for the experimental group in the muscular strength of the muscles working on the shoulder joint to restore the efficiency of the rotary muscles affected in the shoulder joint in dolphin swimming juniors to the benefit of the averages of the dimensional measurements.

Table (4) Significance of differences between Pre and post-measurements of the experimental group in the variables of muscle strength of the shoulder joint For dolphin swimmers with shoulder joint injuries n=10

Variables of muscle strength, flexibility, and degree of pain		Unit	Pre-Measurements		Post-Measurements		Difference between averages	T Value	Percentage of improvement
			Mean	SD	Mean	SD			
Muscular strength	Measure the grip strength of the affected arm	kg	26.1	1.523	30.9	2.182	4.8	9.798*	18.39%
	Pressing weights from horizontally lying	kg	55.8	2.973	64.6	3.747	8.8	8.629*	15.77%
	Press the weights high in front of the neck	kg	48.4	4.325	58.5	3.1	10.1	7.204*	20.86%
	Press the weights high from behind the neck	kg	44.1	2.601	54.2	2.74	10.1	20.023*	22.90%
	Stability with the arms parallel	Sec	20.7	2.75	26.2	1.316	5.5	5.745*	26.57%
	Attachment to the horizontal bar	Sec	24.9	2.024	32.5	1.715	7.6	12.293*	3.52%
	Throwing a medicine ball with the arms back over the head	meter	5.38	0.496	6.71	0.334	1.33	7.675*	24.72%
	Throws a medicine ball with the arms behind the back	meter	2.45	0.319	2.95	0.301	0.5	5.138*	20.40%

\* sig at (0.05)

It is clear from Table (4) that there are statistically significant differences at a significant level of 0.05 between pre-a post-measurements in a variable at the muscle strength of the muscles working on the shoulder joint (rotator muscles) for the injured dolphin swimmers under research in favor of the dimensional measurements, where the calculated "T" value ranged between (5.745: 20.023), which is greater than its tabular value of (1.833).

The researcher attributes this statistical significance to the positive effect The rehabilitation exercise program and what it includes in strengthening exercises for the shoulder joint with weights , which are similar to the motor path With the skillful performance of the dolphin swimmer , as well as the focus on the working muscles corresponding to the shoulder joint so that muscle balance occurs between the muscles surrounding the joint, along with the positive effect of the use of therapeutic massage (superficial and deep), which works to reduce muscle tension , increase relaxation , relieve pain and muscle soreness , improve blood circulation and the immune system, and also the positive effect of using electrical stimulation of the muscles working on the affected shoulder joint , which stimulated the muscles and increased their tension, which improves their endurance For muscular strength, in addition Follow the scientific methods in rationing the loads in terms of (intensity , size , intensity) and taking into account the gradual training load and the individual differences between the loads among swimmers.

Where the study of each of A. Mermekli and R. Mikulski indicated that weight training has a direct effect on the muscle groups working in the skillful performance of the specialized activity, and M. Montagnini, adds that Developing the muscle groups working in skillful performance and neglecting the development of the corresponding muscles leads to an imbalance between the muscle groups, which leads to a high incidence of injuries.[23-25] [45-49]

This agrees with what was mentioned by A. Nogas, and J. Nowotny, On the need to develop the muscular strength of the working (moving) muscle groups in performance and the corresponding (opposite) to them, and Samar Ali Shehata, explains that the imbalance in muscular balance is due to the inconsistent development of the level of strength and to the shortening that occurs In the muscles specific to the level, on the other and due to the weakness of the muscles that are not sufficiently trained.[26, 27]

Wishes for T. Paolucci, that muscular strength is one of the most important physical and motor capabilities that affect the level of performance in sports activities, and muscular strength is one of the most important basic elements in swimming. [28]

Jae Hyeon Jeon, Jin Oh Kim, and Jae Hyeon Jeon indicate that electrical stimulation can stimulate muscle, which increases muscle tension, improves blood circulation, and strengthens muscles. Also, Wael Muhammad Omar indicates that electrical stimulation works on muscle contraction, a contraction that is very similar to the natural contraction of muscles, so it can be used and relied upon to regulate the work of muscle fibers, improve muscle tone, and strengthen muscles. [19]

M. W. Romanowski believes that therapeutic rehabilitative exercises work to improve muscular sensation and regulate the work of the muscles responsible for work and movement, and thus regulate the function of the motor nerves, as by, repetition of the movement, nerve signals are transmitted easily between the nerve fibers with each other, thus helping the injured organ to return to its normal state to perform its full function.[29]

The results of this study agree with those of John Bradley et al, Rima Imad Jassem Huda Badawi Shabab, Muhammed Qadri Abd God 2021, Marwa Muhammad Al-Adrousi, Carole Torres and others, et al Karolyn Toros 2021, Yuiko Matsuura and others, in that The proposed rehabilitation programs with their content, whether (devices or tools), which take into account the individual differences between swimmers, had a positive and statistically significant effect between the pre and post measurements of the experimental group in favor of the post measurement in developing the muscle strength of the muscles working on the shoulder joint of the injured swimmers.[21]

As shown in Table (4), there are improvement rates between the averages of the pre-measurements and the averages of the post-measurements of the experimental group in the muscle strength tests of the muscles working in the shoulder joint of the injured dolphin swimmers under study in favor of the post-measurements. Where the percentage of improvement in the grip strength tests of the injured arm was (18.39%) and the horizontal lying

weight pressure test was (15.77%). And the test of pressing weights high from the front of the neck (20.86%), the test of pressing weights high from behind the neck (22.90%), the test of stability with the parallel arms (26.57%), and the test of hanging on the horizontal bar (3.52%), and the test of throwing a medicine ball with the arms behind from Over the head (24.72%), and a medicine ball throwing test from behind the back (20.40%). Thus, it becomes clear that the first hypothesis is valid.

Presentation and discussion of the results of the second hypothesis: “There are statistically significant differences and improvement rates between the means of the pre and post-measurements. for the experimental group in the Increased range of motion for the flexibility of the shoulder joint Direction (bend and tide) Positive to restore the efficiency of the rotary muscles injured in the shoulder joint of the dolphin swimming juniors in favor of the means of the dimensional measurements.

Table (5) Significance of differences between Pre and post-measurements of the experimental group in the variables of the flexibility of the shoulder joint For dolphin swimmers with shoulder joint injuries n=10

Variables of muscle strength, flexibility, and degree of pain		Unit	Pre-Measurements		Post-Measurements		Difference between averages	T Value	Percentage of improvement	
			Mean	SD	Mean	SD				
Shoulder joint flexibility	The range of motion of the shoulder joint in the direction of the tide.	cm	22.7	2.057	26.4	1.429	3.7	10.091*	16.29%	
	The range of motion of the shoulder joint in the direction of flexion	cm	45.4	2.319	38.9	1.791	-6.5	11.551*	-14.31%	
	Geometric shoulder joint angle measurement	Raise the injured arm high from a standing	degree	191.1	2.282	199.6	2.674	8.5	11.129*	4.44%
		Raise the injured arm behind from standing	degree	69.2	4.022	75.9	2.884	6.7	5.087*	9.68%
		Raise the injured arm out of the way of standing	degree	174.8	2.82	186.9	1.791	12.1	16.090*	6.92%

\* Sig at (0.05)

It is clear from Table (5) that there are statistically significant differences at a significant level of 0.05 between pre and posts measurement variables at Shoulder joint flexibility The injured dolphin swimmers are under study in favor of the dimensional measurements, as the calculated "T" value ranged between (16.090: 5.087), which is greater than its tabular value of (1.833).

The researcher attributes this statistical significance to the positive effect of the rehabilitation exercise program and what it includes of flexibility exercises applied to the experimental group, the diversity of training methods and methods, as well as the nature of the implementation of these exercises, which aim to develop flexibility in its various forms, whether these exercises are individual or couple based on body weight, with the help of a colleague, or exercises using tools and devices which are similar to the motor path The nature of the skillful performance of the dolphin swimmers, as well as the focus on the working and corresponding muscles and the range of motion of the shoulder joint under study

F. Rossi confirms that the flexibility of the shoulder joint in particular plays an important role for dolphin swimmers to meet the requirements of technical performance, when the swimmer raises the shoulders, arms, and head up out of the water, and here there is a decline in the pelvis, and that the weakness of the flexibility of the shoulder joint greatly affects the technical performance and the digital level For swimmers, and adds Khaled Mohsen Mahmoud 2012 that flexibility contributes to The high skill level of swimmers, and the lack of flexibility often leads to the spread of acute and chronic injuries, and for this reason, coaches must pay attention to the development of flexibility and the full range of motion of the joints.[30] [44-47]

L. A. Rossi et al., Sports injuries can occur if the shoulder joint is stretched beyond its normal range, and therefore improving flexibility reduces the incidence of injury.[31]

This is consistent with the findings of the study by A. Rusanov et al., on the effectiveness of flexibility and stretching exercises in preventing injury and the need for them to be the most important parts of physical preparation in training programs for junior swimming.[32]

C. Schwartz confirms it is incumbent on every athlete to work on developing and maintaining a general level of flexibility to make the most of training, avoid the risks of injury, and reach the required level of specific flexibility, to meet the technical performance needs to be required for specialized sports.[33] [44-47]

The results agree with the results of N. L. Stout and N. Tavares., who reported that the proposed rehabilitation programs with their content, whether (equipment or tools), which consider individual differences among swimmers, had a positive and statistically significant effect between the pre-and post-measurements of the experimental group in favor of the post-measurement in developing flexibility, whether toward extension or flexion. Positive for swimmers and increased shoulder joint range of motion [34, 35].

As shown in Table (5), there are improvement rates between the averages of the pre-measurements and the averages of the post-measurements of the experimental group in the shoulder joint flexibility tests. For the injured dolphin swimmers under research in favor of the dimensional measurements, The percentage of improvement in the range's measurement of the motion of the shoulder joint in the tide direction (16.29%), the range of motion of the shoulder joint toward flexion (-14.31%), the measurement of raising the injured arm high from standing (4.44%), the measurement of raising the injured arm behind from standing (9.68%), and the measurement of raising the injured arm to the side from standing (6.92%), and thus the second hypothesis is valid.

Presentation and discussion of the results of the third hypothesis: “There are statistically significant differences and improvement rates between the means of the pre-and post-measurements. for the experimental group in reducing the degree of pain resulting from shoulder joint infections to restore the efficiency of the rotary muscles affected in the shoulder joint for dolphin swimming juniors in favor of the means of the dimensional measurements.

Table (6) Significance of differences between Pre and post-measurements of the experimental group in the variables of Visual Analogue Seale for the degree of pain of the shoulder joint for dolphin swimmers with shoulder joint injuries n=10

Variables of muscle strength, flexibility, and degree of pain	Unit	Pre-Measurements	Post-Measurements		T Value	Percentage of improvement
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		Mean	SD	Mean	SD	Difference between averages		
Pain score scale (VAS) Visual analog of the shoulder joint	degree	5.9	0.994	4.5	1.1	-1.4	8.573*	-23.72%

\* sig at (0.05)

It is clear from Table (6) that there are statistically significant differences at a significant level of 0.05 between pre- and post-measurements. Visual symmetry measure for the degree of pain of the shoulder joint of injured dolphin swimmers in the study in favor of dimensional measurements, as the calculated value of 'T,' was between (8.573), which is greater than its tabular value of (1.833).

The researcher attributes this statistical significance to the positive effect of the rehabilitative exercise program and what it includes to strength exercises for the muscles working in the shoulder joint, in addition to the applied flexibility exercises, therapeutic massage, and the use of electrical stimulation, which works to reduce the degree of pain and muscle soreness, which indicates the gradual disappearance of inflammation in the shoulder joint.

The results of the current study are in agreement with the results of the study of M. Tessaro, K. Törös, and B. J. Tovin that integrated motor rehabilitation positively affects the strengthening of tense muscles activates blood circulation, and relieves pain.[10, 22, 36]

Also, A. Traeger, P. Tunwattanapong, et al, Both agree that the standardized therapeutic exercise programs that include static and dynamic muscle strength exercises, whether free or with free weights, play an important role in reducing the percentage of pain sensation and developing muscle strength in addition to increasing muscle mass, as a result of the implementation of rehabilitative programs, and this appears clearly when comparing the injured limb with the healthy limb, as well as through An increase in the rates of improvement in the post measurements from the Premeasurements, and G. A. Vyacheslavovich added that the physical rehabilitation programs accompanying the reflexology point massage improve muscle strength in the shoulder joint and the muscles surrounding it and relieve the feeling of pain.[37-39-50-51]

This is consistent with what was concluded by N. A. Williams, J. M. Wilson, and O. Zastavna, that rehabilitative exercise programs are useful in improving nerve functions, and this improvement is accompanied by a decrease in associated symptoms such as the feeling of pain and is considered one of the factors that have a direct impact on increasing the speed of recovery and returning to the normal state (pre-injury) as much as possible, which are: Therapeutic massage and electrical stimulation.[40-42], [44-49]

It is clear from Table (5) that there are improvement rates between the averages of the premeasurements and the averages of the post-measurements of the experimental group in the degree of pain of the shoulder joint of the injured dolphin swimmers under study in favor of the post measurements, where the percentage of improvement in the pain score scale (VAS) was visual symmetry. for the shoulder joint (-23.72%), therefore it is clear that the third hypothesis is valid.

## Conclusions:

In the light of the objectives of the research and its hypotheses, within the limits of the research sample, its characteristics, and the methodology used, and depending on the results of the statistical analysis used, the following conclusions were reached:

1. The muscular strength exercises used within the rehabilitation exercise program based on scientific foundations have a positive effect on the development of balanced muscular strength of the working (motor) and

opposing muscles (opposite) in the vicinity of the affected shoulder joint of dolphin swimmers, through increasing the improvement rates between pre and post measurements in All tests of muscular strength.

2. Flexibility exercises used within the rehabilitation exercise program have a positive effect on increasing the range of motion of the shoulder joint of dolphin swimmers in all directions and reaching it as close as possible to its natural state before the injury.

3. The rehabilitation exercise program with the use of therapeutic massage and the proposed electrical stimulation helped reduce the sensation of pain in the injured shoulder joint.

4. The rehabilitative exercise program with the use of therapeutic massage and proposed electrical stimulation resulted in restoring relative recovery of the rotator muscles affected by arthritis of the shoulder joint of dolphin swimmers.

## Recommendations:

Considering the findings, the researcher makes the following recommendations:

Guided by the rehabilitative exercise program with the use of therapeutic massage and electrical stimulation to restore the efficiency of rotary muscles affected by the shoulder joint in all sports.

Educating injured swimmers to undergo rehabilitative sports programs after injury, as it helps them quickly return to practicing the specialized sports activity as soon as possible and at a level close to their level before injury.

Adopting the latest various rehabilitation and therapeutic methods based on scientific foundations to rehabilitate the injured shoulder joint.

Continuing muscular strength training and stretching and flexibility exercises for the shoulder joint after completing the rehabilitation program, to achieve balance in the muscular work between the muscle groups working on the shoulder joint, preserving the range of motion of the joint and preventing it from recurring.

When designing rehabilitation programs, it must be considered that strength development should not be at the expense of flexibility, as well as considering physical loads when training and correct performance techniques for dolphin swimmers so that this does not cause recurrence of the injury or the appearance of a new injury.

Do not rush to resort to painkillers and local anesthetics because the injury has not reached the chronic stage.

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