



ISSN: 2456-0057  
IJPNPE 2022; 7(1): 277-281  
© 2022 IJPNPE  
[www.journalofsports.com](http://www.journalofsports.com)  
Received: 04-01-2021  
Accepted: 09-02-2022

**Ali Abdulkadhim Shyyal**  
General Directorate of Education  
in Maysan, Iraq

**Amal Dawood Abd-Alhasan**  
General Directorate of Education  
in Baghdad, Iraq

**Muthanna Hafedh**  
General Directorate of Education  
in Basrah, Iraq

## The effect of exercises in water and sand in the rehabilitation of partial rupture of the anterior fibular ligament, some physical variables and the degree of pain

**Ali Abdulkadhim Shyyal, Amal Dawood Abd-Alhasan and Muthanna Hafedh**

### Abstract

Injuries to the lower extremity involving the ankle joint are among the most common things that cause dysfunction and therefore will lead to impediments in motor performance and in the sports field as well, and when they are exposed to a lot of friction with the opponent, or falls, or sudden movements, or sprains during play. Thus, it may expose them to deprivation, return to sports activities, and perform physical exercises before the injury. As for The fields of research have included the human field, namely athletes with partial ligament rupture fibular Ankle joint (grade first And the second), numbering (10) injured "athletes" in various activities, while the spatial domain was in Maysan, and the center golden Specialized Jim for Medical Treatment and Rehabilitation, and the temporal domain was determined by the period from 1/11/2020 to 1/1/2021. The researchers concluded: Rehabilitative exercises (water and sand) contributed to improving the range of motion, improving working muscle strength, jumping, and the degree of pain on the ankle joint, Which led to the emergence of good results in the return of the injured to their normal condition. The proposed rehabilitation exercises had a positive and moral effect on research variables among athletes with ankle joint injuries.

**Keywords:** Exercises, water and sand, rehabilitation, partial rupture, ankle ligament

### Introduction

Ankle ruptures are one of the most common causes of dysfunction, and thus will lead to a movement disorder, and such injuries, which are also considered one of the most common injuries in our modern age, especially in the field of sports, and still have a difficult challenge with the health aspect of athletes and their level. Also, it is known that injuries are always associated with sports physical activity by not legalizing training loads in a scientific manner, and this was confirmed by (Kumuna, 2002, p.) (Riyadh 1999, p. 1) that the increase in the percentage of injuries if the athlete is trained in a manner Unscientific or use of sports equipment inappropriate for the age, or low physical fitness for athletes, or mistakes in preparing training plans and increasing training loads. (Qais Al-Douri, 1988, p. <sup>[11]</sup> 197-198) indicates that the ankle joint is a synovial joint with a zygomatoid orbit between the lower end of the bones (tibia and fibula) and the upper and lateral surfaces of the calcaneus bone, that the tibia and fibula bones in the lower extremity differ from the bones of the forearm, as there is no movement between them. Their lower ends are bound to a strong concavity in the form of a clenched fist on the upper and lateral surfaces of the calcaneus bone. This grip does not allow lateral movement from side to side in the ankle joint, except for a slight degree in the case of severe flexion towards the sole of the foot, and the lateral malleolus of the fibula extends lower than the heel medial to the tibia, so the articular surface on the lateral section of the calcaneus also extends to the lower edge of the bone, while the articular surface on the medial section is smaller. Hence, the importance of the current research or presentation of the study focused on knowing the effect of exercises in water and on sand in the rehabilitation of partial rupture of the anterior ankle fibular ligament, some physical variables and the degree of pain.

**Corresponding Author:**  
**Ali Abdulkadhim Shyyal**  
General Directorate of Education  
in Maysan, Iraq

**Research problem:** The problems that lead to the occurrence of many injuries and the most important of those injuries that occur is due to lack of awareness, familiarity and sufficient knowledge of coaches and players in the field of sports medicine and stadium injuries in the absence of a therapist, a good qualification, or the absence of a specialist doctor for the team, as well as The lack of interest in warm-up exercises, preparation, correct technique and avoiding collisions that occur during competitions, so the researchers decided to address this problem and prepare integrated rehabilitation exercises to rehabilitate the partial rupture of the anterior fibular ligament, and through the work of researchers in rehabilitation centers and sports clubs, as it found the most injuries In players, ankle joint injuries are common, including the anterior fibular ligament tear injury in most sports activities that depend in particular on the performance of the ankle joint because it is one of the important joints that the weight of the upper limb sheds on it, so the researchers prepared a study using the method (exercises in water and on sand) included (The effect of exercises in water and sand in the rehabilitation of partial rupture of the anterior fibular ligament and some body variables The degree and degree of pain

### Research objective

1. Preparing rehabilitation exercises in (water and on sand) to rehabilitate the partial rupture of the anterior fibular ligament
2. Knowing the effect of rehabilitative exercises with rehabilitative means on the physical variables and the degree of pain for those with partial rupture of the anterior fibular ligament in the research sample.

### Research hypothesis

1. There are statistically significant differences between the tribal and remote tests of the rehabilitation exercises in (water and sand) in the partial rupture of the anterior ankle ligament in the research sample.
2. There are significant statistically significant differences in the variables of tribal and remote research for rehabilitation exercises in (water and on sand) for those with partial rupture of the anterior ankle fibular ligament, physical variables and degree of pain for those with partial rupture of the anterior ankle fibular ligament in the research sample.
3. There are statistically significant differences in the variables of tribal and remote research for rehabilitation exercises in (water and sand) for those with partial rupture of the anterior fibular ligament, and on the physical variable and the degree of pain in the improvement rates of the injured players in various activities .

### Research methodology and field procedures

The researchers used the experimental method by designing a single experimental equal group with a cardiac and dimensional test, and the research community consists of athletes with partial ruptures of the ankle-fibular ligament, and the research sample who frequented the physical therapy centers in Maysan Governorate, who were chosen by a deliberate method, were selected and numbered 10 injured.

Tests used in the research:

Measurement of kinetic range (flexion - tide) (Banwan, 2018<sup>[2]</sup>, pg. 75)

Measuring the range of motion in the event of tidal and

bending by using a johnmeter Tools used: dynamometer, reclining sofa.

Description of the measurement procedure: The assistant is measured by the side (the injured) while he is lying on the bed, and the genometrometer is placed on one side of the affected knee area from the lateral and medial side, then the patient is asked to extend the injured leg forward and the moving arm of the device moves with the middle axial line and remains The other is fixed in its first position and reads the angle between the two arms of the gynometer, which represents the angle of joint extension of the ankle

Recording: The geniometer indicator is recorded in degrees.

Free Jump Test (Qais Naji Abdel-Jabbar and Bastawisi Ahmed, 1984<sup>[12]</sup>, p. 351)

**The objective of the test:** to measure the vertical distance and flight time.

**Tools used:** Free Power Next Jump and a computer.

### Description of the test method

The belt of the Free Power Next Jump device is connected around the body of the (injured) in the lower abdomen and then turns on the device after connecting the device to the computer, which contains a program for measuring the vertical distance to the maximum height and flight time and measuring the maximum strength, which can receive signals after writing the full information about the injured player (name and height and weight and gender) and the type of jump is determined (one jump or several jumps) and to start the performance, a ringing sound is heard indicating the start of the jump, and through the program connected to the calculator, the complete information and measurements are received via Bluetooth.

Foot strength test: (Khater, Ahmed, Al-Baik and Ali, 1999<sup>[4]</sup>, p. 573)

Objective of measurement: To measure the static force of the extensor muscles of the foot joint

Tools used: dynamometer, form, pen

Performance description: The patient takes a long sitting position on the ground and holds the ground with both hands. The dynamometer belt is fixed on the top of the face of the foot. The patient stretches the joint of the foot muscles in front of the leg gradually until the tension of the device belt according to the player's ability.

Recording: The amount of force is taken in kg

The degree of pain: (Al-Ghamry, 2001<sup>[14]</sup>, p. 56)

Siham Al-Sayed Al-Ghamry<sup>[14]</sup> (2001) quoting William (1997)<sup>[6]</sup> indicates that the pain scale is done by asking the patient after the manual examination by the doctor. It refers to the measurement of ankle joint pain, where the scale is a line at the beginning (zero) representing the absence of pain and the end of it (10) represents acute pain and presents to the patient daily a new line. In 80% of cases, the result of this measurement is close to the doctor's diagnosis, as the patient is to explain the pain in a general way if the importance of clinical examination appears to determine the places accurately.

Components of the preparatory exercises: After preparing for the experiment, preparing and controlling the variables, the researchers prepared the preparatory exercises, including (exercises in water and on sand), as they relied on the analysis of scientific references and research conducted on this subject, where they were divided into two phases consisting of (8 weeks). With different repetitions, starting from easy to

difficult, with a time ranging from (25 minutes - 50 minutes), at a rate of (4) units per week.

The first phase lasted for (3) weeks, at a rate of (4) units per week, and it contains a set of rehabilitative exercises that are consistent with the phase the injured are going through, including exercises in water (flexibility, muscle lengthening, balance exercises, and work to relieve and remove pain) used in Suggested rehabilitative exercises for minor and moderate ankle injuries

#### First stage goals

- Reduce fluid and relieve pain
- Improving the range of motion of the ankle joint
- Developing muscle strength for the leg and foot muscles
- Balance and static exercises
- As for the second stage, it lasted for (3) weeks, with (4) units per week, and it contains exercises on the sand and contains (strength exercises, resistance exercises, walking exercises and sand jumping) with ascending repetitions commensurate with the condition of the ankle injury after the completion of the first stage

#### The goals of the second stage

- and improvement in the surrounding and working muscle strength of the ankle joint

- Elevating and increasing the elasticity of the muscles in the ankle joint
- Mastering the correct motor work are no tumors or pain in the ankle joint

In the penultimate weeks, it is possible to exercise full balance, and to perform exercises normally on the sand

#### What does this study add?

Using two qualifying means of resistance, such as (water - and sand) at the same time

The use of the two rehabilitation methods in the lengthening, flexibility, and strength of that injury.

Reducing the pressure placed on the affected member in the lower extremity and giving freedom to apply and perform rehabilitative exercises without significant pain.

Improving and developing the muscles working in the lower extremity and surrounding the affected organ, in addition to developing the muscles in the upper extremity through the application of the two means (water and sand)

Improving the level of breathing and blood perfusion of the patient through the application of these two rehabilitation methods

#### Results

**Table 1:** It shows the arithmetic means, standard deviations, the value of the differences and the calculated t - test value for the pre and post tests for the variables used in the research.

T	Statistics		The difference	Standard deviation	T. Value	Sig	Rate	
1	Flexing	Pre-test	35.640	8.25-	0.641	256.79	0.000	%56.11
		Post-test	43,890		0.540			
2	Extension	Pre-test	13,520	6.07-	0.278	204.11	0.000	%80.41
		Post-test	19,590		0.303			
3	Maximum height	Pre-test	0.16	0.31-	0.0066	149.14	0.001	%99.54
		Post-test	0.46		0.0099			
4	Flexor strength test	Pre-test	6.772	19.246-	1.008	21,957	0.000	%73.98
		Post-test	26,018		3.737			
5	Extensor muscle strength test	Pre-test	4.236	13.309-	0.854	19,598	0.000	%82.45
		Post-test	17,545		2.814			
6	Degree of pain	Pre-test	6.200	3.00-	0.836	9,487	0.001	%96.8
		Post-test	3.200		0.836			

Significant below the degree of freedom of 9 and the level of significance (0.05)

And it appeared from the table, that there are significant differences in the kinetic range tests (flexion, extension, etc.) between the pre and post tests for the research sample and in favor of the post test

The researchers attribute the emergence of moral differences to the effectiveness of the rehabilitation exercises that he prepared and the use of water and sand exercises, which means, the rehabilitation exercises have shown a positive impact on the characteristic (flexibility in the ankle joint) represented by testing the kinetic ranges, and this means that the kinetic ranges improve through the performance of exercises flexibility, and lengthening., which is specifically for those injuries in their initial stages, and the various and various exercises that gave satisfactory, effective, and positive results in improving the research variables in general and in particular the kinetic ranges, as the injury to this joint, and the pain that accompanies them directly affect the activities and movements functional, which leads to atrophy of the muscles surrounding the joint, and the determination of its range of motion, and this was confirmed by (Mervat El-Sayed Youssef, 1997 <sup>[6]</sup>, p. 213) "that the muscles gain the ability to stretch as a result of water exercises. The gradual exercise

with easy and simple exercises in the early stages had a good and tangible result in the progression of the level of improvement of the injury, and the selection of good and appropriate exercises for the injury has pain. Indicator and the great role that make him the cornerstone and the success of those rehabilitation exercises prepared.

He pointed out (Mufti Ibrahim Hammad, 2010 <sup>[8]</sup>, p. 443) that "the joints always need continuous movement, as they need movement in a wide range in order to maintain their range of motion in an appropriate manner." Also, exercises designed for the purpose of improving strength, jumping with regular and gradual repetitions, and rest times between repetitions as well, Contributed to this improvement as they used water exercises including resistance exercises within the water medium to improve the muscle strength of the injured leg. And the duration of the rehabilitation exercises that were applied to the injured in the research sample led to an improvement in the total muscular strength of the ankle joint, and jumping, and this was confirmed by (Jamal Sabry 2012 <sup>[3]</sup>, p. weeks"

This result confirms that there are statistically significant differences between the tribal and remote measurements in

the flexor and extensor muscle strength tests in favor of the post-measurement, meaning that there is an effect of the rehabilitative exercises used and included using rehabilitative exercises inside the water basin and on the sand for the strength of the flexor and extensor muscles of athletes with external ankle sprain. She indicated (Mervat El-Sayed Youssef <sup>[6]</sup>, 1998, p. 212) that rehabilitation exercises are practiced with the aim of treating a part of the body that was injured

The researchers added that the regular repetitions, the gradual work, and the correct rest times for the exercises placed within the preparatory sessions led to the significant differences between the pre-test and the post-test for the research sample. The characteristic of jumping, strength, and compound exercises that are given with calculated, regular and codified training doses far from stress and close to the state of effective fatigue. Training on this characteristic is naturally accompanied by some kind of changes, or physiological and morphological fluctuations of the player's body organs and organs, and using the principle of gradual increase in training burdens for the purpose of Matching them with the player's vital ability during training, we can gradually improve those physical qualities that are special and important in team games.

The researchers confirm that there are many and multiple benefits to muscular strength that must be preserved and returned to what it was before the injury, and this is done through regular muscular strength exercises that well increase muscular strength and ligament strength and thus the strength of tendons and joints, and this was confirmed by (Jamal Sabry

<sup>[3]</sup>, 2012, p. 415) "Muscular strength helps improve health by increasing the stabilization of muscles and joints and gives the ability to face many sudden injuries."

The researchers believe that the improvement in pain degrees is due to the methods used included in the rehabilitative exercises, and this indicates a mechanism (Osama Riyad, 1999 <sup>[10]</sup>, pp. 27-28), where there is an improvement in pain scores as a result of the researchers' use of various rehabilitative exercises, which contributed to achieving an improvement in the level of pain. The level of pain relief, and this improvement is due to the effect of the effectiveness of the rehabilitation exercises used, which reduce tension and fatigue in the muscles.

The researchers also believe that the diversity of resistance exercises in the water and on the sand, which included the variables within the qualifying exercises in (water and on sand) helped to improve jumping and strength, and this is what was indicated by him (Raad Jaber <sup>[13]</sup>, 1995, p. 19) "The muscular applications of exercises and this What depends on the type of exercises in the rehabilitation sessions used, which will gain them strength that will be reflected in their improvement."

The researchers also believe that it requires the development and improvement of these variables by improving the physiological and psychological level of the players of various activities, which is known as "the ability of a muscle or a group of muscles to perform motor performance as long as possible within the limits of respiratory and motor functions."

**Table 2:** Rehabilitation session for a group of weeks

Week (3,2,1)	Rehabilitation of flexibility, stretching of the muscles working on the ankle joint, balance and pain relief	Total time (25-28) d
Qualifying exercises (1, 2, 3, 4)		

**Table 3:** Repetition Suggested qualifying exercises

T	Repetition Suggested qualifying exercises	Number of Repetitions	Performance Time	Rest Between Repetitions	Rest Between Each Exercise	Single Exercise Time
1	Sit on the edge of the pool and feel the water and the movement of the foot inside the water right, left, up and down 20 seconds	5	20 sec	20 seconds	30 seconds	180 sec
2	Sitting on the edge of the pool and fully rotating the leg in circles in the pool 5 times	5	2-3 s	6	=	35 sec-39 sec
3	Standing in the pool, writing the alphabet with your toes	5	4-5 sec	10	=	60sec -65sec
4	From a standing position in the pool and then walking on the insteps for a distance of 5 meters	3	7-10 sec	20	=	65sec-70sec
5	Sit on the edge of the pool and hit the water hard while raising and lowering the affected foot (5) times	5	2-3 sec	6	=	35s-40s
6	From a standing position inside the pool, drop your body weight (a quarter of femoris muscle, a half of a dpi) inside the pool (5) times	5	3-4 sec	8	=	45 sec - 52 sec
7	Walking in the pool and then light and medium jogging inside the pool for a distance of (5) meters	5	4-6 sec	12	=	70-78sec
8	From a standing position in the pool (standing on one foot and then lowering your body weight into the pool) (5) times	5	5-6 sec	12	=	70-80 sec
9	Tie a rubber band to the feet and move the affected foot in all directions (front, back, right, left) and for each direction (3) times inside the pool	3	3-4 sec	8	=	30-36 sec
10	The casualty stands inside the swimming pool at an appropriate distance, leans on the wall or a barrier on it, feet in the pool, bends the knees, stands on the heels, then remains steady (5) times	5	5-8 sec	16	=	100-110 sec
11	We tie a belt around a plastic piece and raise the piece up by the injured ankle (5) times	5	4-7 sec	14	=	85-90 sec
12	From a sitting position on the edge of the basin, put the affected foot on the other, healthy foot, and push hard into the water (3) times	3	2-3 seconds	6	=	20-27 sec

13	From a standing position on the edge of the pool, put the affected foot on a small and long piece of plastic and push down firmly into the water (5 times).	5	2-3 sec	6	=	20-27 sec
14	Moving and pressing the injured foot on a large piece of plastic inside the pool for 10 seconds	5	10 sec	20	=	90-100sec
15	From a standing position on the balance device in the pool and then balance on the affected foot for only 10 seconds	5	10 sec	20	=	120-130 sec

### Conclusions

1. Rehabilitative exercises (water and sand) led to a noticeable improvement in increasing the range of motion, working muscle strength, jumping, and the degree of pain on the ankle injury, which led to a good improvement in the return of the injured to their normal position.
2. The proposed rehabilitation exercises in (water and sand) had a positive and moral effect on research variables among athletes with ankle joint injuries.
3. The exercises and the two rehabilitation methods (exercises in the water and on the sand) have a clear impact on the respiratory rate and blood circulation of the injured.

### Recommendations

1. Following rehabilitation exercises in (water and on sand) in a specialized and varied manner in order to rehabilitate the ankle joint for the injured.
2. Conducting similar research and studies concerning all injuries to the body in the upper and lower parts.
3. Not to apply these two rehabilitation methods without prior knowledge and knowledge on all injuries, and it is necessary to know whether the injured person has a lack of motor performance in some of the affected joints, or has some injuries in the knee joint or another organ.

### References

1. Adel Abu, Quraish Abdul-Mabood. The effect of a suggested rehabilitation program on sprained joints among team sports players. Published, 2001.
2. Bashar Hassan Banwan. The effect of a rehabilitation approach using Kinesio adhesive tapes and treatment in the rehabilitation of athletes with partial rupture of the hamstring muscles, PhD thesis, College of Physical Education and Sports Sciences, University of Baghdad, 2018.
3. Jamal Sabri Farag, Strength, Ability and Modern Sports Training: (Oman, Dijla Publishing House, 2012).
4. Khater, Ahmed, Al-Baik, Ali. Measurement in the Mathematical Field, (4th Edition), Dar Al-Kitab Al-Hadith, Kuwait, 1999.
5. Lacoma, Team, Encyclopedia of Sports Injuries and How to Deal with them, 1st Edition, Dar Al-Alama for International Publishing, 2002.
6. Mervat El-Sayed Youssef. The Effect of a Suggested Program Using Water Exercises to Rehabilitate Working Muscles on the Knee Joint, Anterior Injured Ligament Surgery, (Scientific Journal, Faculty of Physical Education for Boys, Cairo, Helwan University, 1997).
7. Mervat El-Sayed Youssef. Studies on the Problems of Sports Medicine, 1st Edition, Alexandria, Al-Radia Technical Library and Press, 1998 AD.
8. Mufti Ibrahim Hammad, Physical Fitness for Health and Sports, 1st Edition, (Cairo, Modern Book House, 2010).
9. Muhammad Esmat Al-Husseini. The effect of a rehabilitation exercise program on the repetitive sprain of the lateral ligament of the ankle joint in some athletes,

unpublished master's thesis, 2001.

10. Osama Riad, Physiotherapy and Rehabilitation of Athletes, 1st Edition, Dar Al-Fikr Al-Arabi, Cairo, 1999.
11. Qais Ibrahim Al-Douri: Anatomy, 2nd Edition: (Ministry of Higher Education and Scientific Research, University of Baghdad, 1988).
12. Qais Naji Abdul-Jabbar, Bastawisi Ahmed. Tests, Measurement, and Principles of Statistics in the Mathematical Field (University of Baghdad, Higher Education Press, 1984).
13. Raad Jaber Baqer. The effect of strength training with speed on some physical and skill variables for basketball, (PhD thesis, University of Baghdad, College of Physical Education, 1995).
14. Siham Al-Ghamry: The effect of a suggested program of rehabilitative exercises and therapeutic massage on early pain with patellofemoral joint syndrome, unpublished Ph.D. thesis, Faculty of Physical Education for Boys, Helwan University, 2001.