



The effect of Rehabilitation Program By Using Therapeutic Exercises and Accompanying Means on the restoration of the Sprained External Ankle Joint's Function in Futsal Players

Dr. Zaid Sadoun Aziz Al Saady 

Ministry of Education/Missan Directory. Iraq

*Corresponding author: zaidzaid71@hotmail.com

تاريخ نشر البحث 2024/10/28

تاريخ استلام البحث 2024 /6 /4

Abstract

The study aims to determine the effect of a rehabilitation program by employing therapeutic exercises and accompanying means on restoring the sprained external ankle joint's function among futsal players. The researcher has used the experimental method of a single group system because it suits the nature of the research.

The researcher has intentionally chosen the research sample from first-class futsal players, numbering (8) players. The survey has been applied to (4) futsal players from outside the research sample to calculate the scientific coefficients of the tests employed in the current study. The researcher has conducted measurements of pre- and post-measurements on (6) regular players in the rehabilitation program's implementation.

The rehabilitation program has been carried out for six weeks, with 3 sessions per week, a total of 18 sessions, and a time of 45 minutes for each session, then post-measurements have been conducted and the results have been as follows: The rehabilitation program has a positive effect on developing the strength of the extensor and flexor muscles of futsal players suffering from first- and second-degree external ankle joint sprains. The training program has a positive effect on the flexibility of the external ankle joint for athletes with first- and second-degree sprains. The rehabilitation program reduces pain and restores the ankle joint's functional condition as before the injury occurrence.

Keywords: futsal, ankle sprain, sports rehabilitation, getting back to playing



Introduction

Football is considered as the most popular and widespread sport throughout the world, as the International Federation of Association Football (FIFA) includes 270 million registered players (44). This increasing number of players leads to an increase in the frequency of injuries, and the cost of treatment resulting in the absence of players from matches or training

Sports injuries a player is exposed to vary according to the activity he practices, each sport activity has its character and characteristics that are determined by its contents and components in terms of its skill and tactical requirements, the manner of physical and psychological preparation, the conditions of competition, the type of field on which it is performed, the number of players, and the system and timing of organizing the tournament. The availability of security and safety factors, the level of the player, and his experience may all contribute to determining the type, degree, and seriousness of sports injuries to which the player is exposed while practicing a certain type of sports activity

In general, sports injuries are considered a very serious hindrance for those who practice public team sports, especially if the body or part of it is exposed to a force that exceeds its ability to endure. This reduces the level of players' physical and skill performance and may be the reason for the player's early retirement, as the injury can cause some complications

Many studies have indicated that football including futsal has a higher rate of injuries than hockey, volleyball, handball, and basketball (26.27). Football is a contact sport characterized by short, fast movements with changes in directions, sudden turns, tackling and revolving around, shooting, kicking, and complex and difficult technical procedures that require high physical effort to bring the athlete to the highest levels.

This increase in the frequency of training and other physical demands of playing football matches throughout the season may lead to an increase in injuries, especially to high-level players and young people striving to be elite players. Soccer injuries are related to the player's age, exercise load, and level of play and training (28).

Athletes who participate in physical sports are more likely exposed to acute ligament injuries, muscle tears, and fractures, all of which are secondary results of violent contact among competitors.

Ankle injuries are the most common and may reach 85% of all joint injuries because the ankle is one of the most complex joints in the body. The injury is often a tear or stretch in the ligaments that connect the ankle bones (31).

The external ankle joint injury is the most common among the public. It is estimated that more than 23,000 ankle sprains occur daily in the United States, equivalent to about one sprain for every 10,000 people per day. It is also the most common among athletes, as ankle sprains constitute up to 45% of sports injuries (31). A sprained external ligament of the joint also constitutes about 75% of ankle injuries, and this injury may turn chronic in about 40% of cases due to either lack of good diagnosis or failure to undergo a complete rehabilitation program

Regarding the game of football, many studies have indicated a high rate of ankle injuries to players, as a study by Andersen (1989) and a study by Hansen et al indicated that external ankle joint sprains constitute a high percentage of the total injuries to which football players are exposed, and 67.3% of football players suffer from an ankle sprain during training or competition (39), and ankle sprains injuries to futsal player accounting for over 40% of all injuries (45).

This injury is usually accompanied by many negative effects, including lack of mobility of the joint, which leads to stiffness, shortening, and limited movement in the ligaments and muscles working on the joint (39).

The risk factors for ankle injuries can be identified as internal and external. External factors include training errors, sport type, competition level, environmental conditions, and type of football pitch.

Internal factors include weakness in muscle strength, limitation in range of motion, and looseness of ligaments, as well as the skeletal system of the joint.

The injury may occur either suddenly due to the foot being subjected to internal flexion while engaging in a sporting activity such as walking, running, and jumping on uneven ground, or through direct contact with an opponent such as hitting, in addition to this being linked to other causes such as the artificial court surface, the type of shoe that the player wears, and the method of protection it provides for this the joint. or through direct contact with the opponent, such as hitting, in addition to this being linked to other reasons, such as the artificial court surface, the type of shoe that the player wears, and the method of protection it provides for this joint.

A sprain occurs when the foot is damaged or moves abnormally outside the joint's normal range. When tilting or falling, the body's weight exerts a large force upon landing and may cause the ligaments to expand beyond their normal rate, exposing them to tearing, pain, and swelling (25:3). Figure No. (2) shows 3 degrees of ankle sprain.

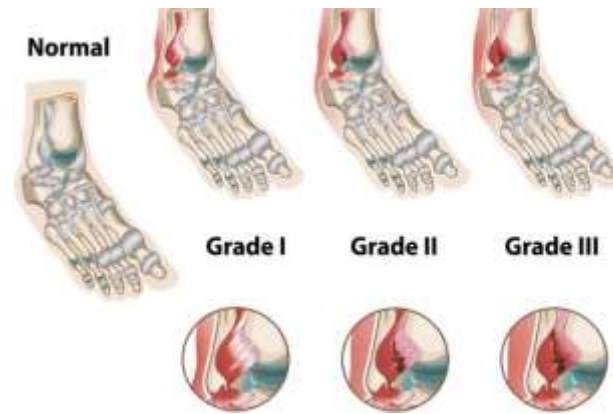


Figure No. (2) shows 3 degrees of ankle sprain.

Injury to the ankle joint ranks first with injury to the knee joint due to the danger to the future of athletes, it is considered one of the areas of the foot most susceptible to injury due to the great effort to which this joint is exposed because of great fatigue and frequent use, which leads to unfortunate results, especially if the injury is repeated to this part of the foot may result in having the player get away from the field for long periods.

“Mohamed Qadri Bakri” 2020 shows that sports injuries are considered the main obstacle to the progress of the heroic sports level, as they hinder the process of the gradual development of sports training. Thus it is not possible to achieve the sports goals that are intended to be fulfilled

Given the collateral ligaments (particularly the anterior talofibular ligament) of the ankle joint play the primary role in ankle stability (35), damage to these ligaments after an initial injury (e.g., ligament sprain, tear) can contribute to recurrent injuries.

As those who suffer a primary injury are more likely to recur, especially if they are not well-qualified, lateral ankle sprains are a common injury with a very high degree of recurrence in athletes (34). It may reach the point of severe sprain and become more serious, so there must be special attention and care for such injuries as to avoid making any mistake that could lead to a

recurrence of the injury that may force the player to stay away from the field for long periods.

There is still much debate about the best way to manage these injuries and the most effective testing methods that reduce injury recurrence once the athlete returns to training and competition.

This makes it necessary for workers in this field to be practically qualified and proficient in various experiences, especially in the sciences of sports injuries and sports medicine, which are among the important sciences for preserving the health and safety of the player and protecting him from injuries, as well as preventing the recurrence of injury, which, as I mentioned, may constitute a major obstacle in his career. towards higher sporting levels, in addition to the resulting cost of treatment and the absence of players from matches or training (25.26).

So, the important role of sports rehabilitation methods indicates that therapeutic exercises are considered one of the most important methods at this stage because of their positive effect, as exercises along with the means play an important role in the injured player's return to his normal condition before the injury or after surgical intervention in particular, and also in the condition of the treatment program for the injured person based on sound scientific foundations

Rehabilitation programs are based on three bases: Guiding and controlling the injury in its various stages, starting from the pain, then passing through the stages of healing, and returning of the injured limb to its normal state as quickly as possible until achieving improvement and flexibility increase and muscular strength of the injured limb (32). In addition to neuromuscular control, the ankle and foot are better controlled and protected during stopping or moving (41).

Research problem

Hence the importance of the research lies in developing a rehabilitation program for the sprained ankle joint by creating exercises that are graded in difficulty and programmed in a thoughtful, scientific manner, to ensure the player's recovery and rapid return to the field with the same ability or functional efficiency before the injury occurred, as well as reducing the injury recurrence among players affiliated to the Iraqi Futsal League.

As the researcher's work lies in rehabilitation and sports injuries, so he visited some clubs and rehabilitation centers. He conducted a questionnaire to identify the number of sports injuries in general and the ankle in particular. He noted that many athletes are exposed to ankle injury, especially recurrence injury, for many reasons, including a lack of interest in good warm-up by the players before the matches resumption or training and conducting all competitions and training units on artificial tartan. On the other hand, the researcher indicated that the coaches and players are unfamiliar with sports injuries, physical therapy, and rehabilitation, as well as the lack of special rehabilitation centers in clubs with more specialized staff to treat injured players, which made the player pay a high price by involving players with sprains given that it is a mild injury without exposing the players to specialists to diagnose the condition and to treat it, and then complete rehabilitation. Thus, we find that the injury is constantly recurring.

Therefore, the researcher in the current study decided to develop a rehabilitation program based on scientific foundations to rehabilitate the external ankle joint sprain for futsal football players so that it would be an indicator for reconsidering the methods of injured players rehabilitation and making them fully recover from injuries and the resulting improvement in the level of performance and achievement.

Research Aims

The study's goal is to identify the effect of a rehabilitation program using exercises and accompanying methods on restoring the sprained external ankle joint's function in futsal players through:

Identify the effect of the rehabilitation program on muscle strength in the muscles working on the ankle joint.

Identify the rehabilitation program's effect on the ankle joint's range of motion.

Identify the effect of the rehabilitation program on reducing the degree of pain in the affected ankle joint.

Research hypotheses

There are statistically significant differences between the pre-and post-tests in the variable of muscle strength of the foot in the cases of grip and extension, in favour of the post-test.

There are statistically significant differences between the pre-and post-tests in the range of motion of the ankle joint, in favour of the post-test.

There are statistically significant differences between the pre-test and post-test in the degree of feeling the pain intensity in favour of the post-test among members of the research sample.

Research fields

Human fields: Missan Club, Ahrar Missan Club, Maymouna Club, and Qalaat Saleh Club,

Time field: from 19-2-2023 to 5-4-2023

Spatial field: Missan Gym, Shams Clinic for Physiotherapy and Physical Rehabilitation, and Missan Stadium

Research Methodology

The researcher used the experimental method of one group system as to suit the nature of the research.

The research community and its sample

The researcher selected the research sample intentionally, namely first and second-class futsal players from Missan province, who suffered from a sprain in the external ankle within the clubs participating in the Iraqi First Class League and registered in the lists of the Iraqi Football Association, numbering (8). Six players have been chosen as an experimental research sample who belong to Missan clubs, Ahrar Missan , Maymouna Club, and Qalaat Saleh Club. The researcher conducted the exploratory experiment on (4) futsal players from outside the research sample.

Tools, devices, and means of collecting information

- Stopwatch
- Data collection form.
- Plastic chairs.
- Terrace.
- Flexible rubber.
- Wall mind.
- White paper + pen to record the score.
- Pain measurement test form.
- A glucometer is a device used to measure the range of motion of the ankle joint.
- Weights of different weight.
- A dynamometer device to measure the strength of the extensor and flexor muscles working on the ankle joint.
- Balance disc.

Means of collecting information

- Arabic and foreign references.
- A questionnaire form to determine type of injury.
- Personal interviews.

Exploratory experience

The researcher conducted the exploratory sample on a sample consisting of 4 players from outside the research sample on Sunday (19/2/2023), to reveal the difficulties facing the researcher when starting the basic experiment and to prepare in advance for the requirements of the experiment in terms of cost, duration, validity of devices and tools, etc. Several strength and flexibility tests were presented to experts and agreed on one test for each.

Pre-tests:

Pre-measurements in the research variables were conducted on Monday (20/2/2023).

The researcher sought the help of private sources, experts, and specialists in sports injuries and rehabilitation, physiology, and football, Appendix No. (3).

Tests

Measuring the degree of pain:

The researcher prepared a special form to measure the degree of pain using the Visual Analog Scale (42).

To measure the degree of pain, which includes numbers that show the level of pain, starts from 0 to 10 degrees, where the number is chosen that represents the intensity of the pain. The higher the degree gets, the greater the pain increases. A score of (0) indicates that there is no Pain.

The first test: A test to measure the degree of pain in the ankle joint.

Test objective: To measure the degree of pain in the ankle joint in all directions. Testing tools: A chair a questionnaire to measure pain intensity, goniometer device.

Starting position: The athlete is examined from the seated position on the chair, with the other leg bent at the knee and the affected leg extended. The examiner slowly performs plantar flexion of the foot from the affected ankle joint. If the patient does not feel pain in the first test, the examiner asks the injured player to extend his foot more and more until he feels the pain first. The same test is repeated on the other joint.

Scoring method: Record the score from zero to ten.

The second test: The muscular strength test

First test: Strength test (30)

The test aims to measure foot strength:

The test takes a long sitting position on a Swedish chair with the back touching the wall.

The leg is fixed with a belt at the knee. It is necessary to have wooden support behind the seat when the tested 's back is in contact with the wall. The belt connected to the dynamometer is attached to the injured person's foot.

Performance method: The strength of the flexor muscles is measured.

Second test: Strength test (30)

The test aims to measure foot strength:

The test takes a long sitting position on a Swedish chair, facing the wall, to measure the strength of the foot extensor muscles.

The leg is fixed with a belt from the knee. It is necessary to have wooden support behind the seat when it is facing the wall. The belt connected to the dynamometer is attached to the injured person's foot.

Method of performance: The strength of the extensor muscles is measured.

Registration: Three attempts are given, and we take the best of them.

The third test: Testing the range of motion of the ankle joint area using a goniometer, which includes the measurement of:

- Plantar flexion
- Dorsiflexion
- Eversion
- Inversion (43)

The angles of the ankle joint have been measured from the patient's sitting position on the medical bed, with the leg in a relaxed state and extended downward, and the foot joint in its natural position. The cyanometer device is installed on the ankle joint from the lateral side, and the fulcrum of the angle axis is on the articulation point in the ankle. Then We ask the injured person to move the foot outward and inward to the maximum extent to measure the external eversion angle of the ankle joint, and the inward eversion angle. The measurement is taken, and the measurement of the dorsiflexion angle of the joint and the plantar flexion angle are recorded at the maximum extent. The anterior joint angles of the ankle have been measured and it is the normal

degree for a healthy leg about external inversion (25) degrees, inversion (35) degrees, dorsiflexion (20) degrees, and plantar flexion (50). These angles that have been measured in this research may represent major angles of operation of the ankle joint.

Scoring: The score is calculated when reading the angle the goniometer indicates.

Three attempts are given and the best of the two is taken.

The main experiment

The researcher designed the rehabilitation program, and distributed the program to several specialized arbitrators, to ensure that the selected methods and exercises were appropriate with the nature and degree of the injury. Appendix No. (3)

The rehabilitating method (the main experiment) has been applied to the experimental sample starting from Tuesday, 21/2/2023, until Tuesday, 4/4/2023, as follows:

- The treatment method used (rehabilitation exercises).
- Duration of the curriculum (6 weeks).
- The number of rehabilitation units (three units per week).
- Exercises are to be started to improve flexibility until the goals of the first stage are completed, the first and second weeks, while getting used to strength exercises using low-intensity rubber bands.
- In the third and fourth weeks, there is an exercise session to develop balance and improve strength, range of motion, and neuromuscular coordination.
- In the fifth and sixth weeks, all sessions are for developing muscle strength.

- The time for one rehabilitation unit is (40–50) minutes, depending on each stage.

The exercises have been performed in the main section of the training unit, with a time ranging from (25–to 35) minutes and immediately after the warm-up.

- The number of rehabilitating exercises (23 exercises), (5) for the first stage, (8) for the second stage, and (10) for the third stage.
- Number of repetitions (3).
- Number of groups 3.
- Rest between exercises for 30 seconds.
- Rest among groups for 1 minute.

The details of the rehabilitation curriculum were as follows:

General warm-up: “Walking, jogging, stretching exercises for the muscles of the upper extremity, rotating the trunk, and stretching exercises for the muscles of the lower extremity” (ten minutes).

Special warm-up:

Doing stretches for all body parts, focusing on the calf muscle and the muscles working on the ankle joint for five minutes.

The main section: It includes implementing rehabilitation exercises to rehabilitate the ankle affected by an external sprain, and it took (25–35) minutes according to each stage. During the rehabilitation process, the researcher focused on using exercises to improve the joint's flexibility, in the form of repeated contractions, stretching, and stretching the foot forward, turning the foot inward and outward to activate the joint and prevent atrophy of the muscles working on the joint, with strengthening exercises using rubber

bands of varying intensity and exercises with devices that should strengthen the calf muscle and the muscles working on the ankle joint. When using the rehabilitation exercises, the researcher considered grading from easy to difficult, emphasizing performing the exercises correctly, and having the sample members are constantly emphasized if they feel pain, they must immediately stop performing the exercise or modify it to prevent the appearance of pain.

Post-tests

Post-measurements have been conducted on the research variables for the experimental group on Wednesday (4/5/2023) after the end of the proposed training program period.

Statistical coefficients used.

- SMA.
- Standard deviation.
- Pearson correlation coefficient.
- Test. T

The researcher analyzed the data using statistical analysis software, SPSS.

Present and discuss the results

The first research hypothesis: range of motion of the ankle joint.

Table No. (1) shows the arithmetic mean, standard deviation, and T value calculated for the research sample in the tests under study.

Table (1) Results of the sample t-test to identify the effect of the rehabilitation program on ankle joint injury among football players, n=6.

Measurements	Normal range(degree)	Pre-test		Post-test		T Value	Sig
		Mean	Std. Deviation	Mean	Std. Deviation		
Range of motion							
Planter flexion	50°	16.66	4.67	46.00	1.09	18.038	0.00
Dorsiflexion	20°	8.66	3.50	18.00	0.89	7.95	0.00
Inversion	35°	14.00	3.57	32.83	1.16	17.487	0.00
Eversion	25°	11.50	1.87	22.50	1.87	11.000	0.00

It is clear from Table No. (1) that the T value calculated for testing all paired sample values, which aimed to compare pre-and post-measurements of joint flexion degrees, was statistically significant at the significance level (0.05). This indicates the rehabilitation program's positive effect on players' ankle joint injuries. In futsal football, there was an increase in the degrees of plantar flexion of the ankle joint and the dorsal ankle joint, as well as an increase in the range of motion on the medial and lateral side in the degree of the ankle joint among futsal football players. Therefore, there are statistically significant differences between the pre-and post-measurements for the measurements under study and in favor of the post-measurements.

The researcher attributes these results to the role of therapeutic exercises and the accompanying methods in treating various sports injuries, as its first phase included negative and then positive range of motion exercises of gradual intensity, which led to developing the range of motion of the injured ankle joint.

This is what Farraj Abdel Hamid (2005) stressed that the early start of rehabilitation programs with organized and comprehensive exercises on flexibility and strength of the muscles and joints and avoiding the occurrence of pain in the early stages of the program lead to accelerating the return of the injured person to his normal position before the injury occurred (8).

The study of (McCoone 96–100) (1993) also indicates that paying attention to therapeutic exercises and other accompanying physical therapy methods and using exercises or passive movements in the early stages of the injury may give positive and advanced results and that the effect of the rehabilitation program and the selection of appropriate and effective therapeutic exercises have a significant role in the success of any treatment program linked to the ankle's range of motion, and this is what the researcher sought during the program.

One of the most important results of the study was that high–efficiency balance exercises are very important for improving the condition of the sensory receptors at the ankle joint, as these exercises showed a clear improvement in the balance of the joint, as well as an improvement in the strength of the ankle joint's performance of all its movements, as well as preventing the recurrence of the injury.

This was confirmed by the study of (Imad Kazem Khalif and Iftikhar Ahmed Ali) (2019) that balance exercises accompanied by therapeutic methods helped significantly in improving the range of motion of the ankle joint (9).

The results of the current study are consistent with the results of the study of Muhammad Omar Abdel Qader 2016 (11), the study of Abdel Salem Bakr

Abdel Salem (2019) (10), and the study of Adel Abu Quraish Abdel Maboud 2001 (12).

This confirms that rehabilitative exercises have a positive effect on improving the range of motion of the joint.

This result confirms the validity of the first hypothesis, which states that there are statistically significant differences between the pre-and post-measurements in the motion range test in favor of the post-measurement.

The second research hypothesis is the muscular strength of the flexor and extensor muscles of the foot.

Table (2) results of the sample t-test to identify the effect of the rehabilitation program on ankle joint injury among football players, n=6.

Measurements	Pre-test		Post-test		T Value	Sig
	Mean	Std. Deviation	Mean	Std. Deviation		
Muscular strength(kg)						
Foot flexor strength (kg)	8.16	3.32	35.0000	2.60	18.038	0.00
Foot extensor muscle strength (kg)	11.3333	3.32	45.00	2.89	35.270	0.00

It is clear from Table No. (2) that the T value calculated for testing all sample values, which aimed to compare the pre-and post-measurements on the foot muscle strength variable in the cases of grip and extension, was statistically significant at the significance level (0.05).

There was a significant improvement in the variable of muscle strength of the muscles working on the ankle joint during contraction and extension among the sample members between the pre-and post-measurements and in favor of the post-measurement.

The researcher attributes these results to the role of the rehabilitation program in treating various sports injuries.

This means that there is an effect of the training program using rehabilitative exercises and the accompanying methods in strengthening the flexor and extensor muscles of the external ankle joint for players with sprains, as the gradual intensity of the exercises was one of the most important focuses of the researcher, as the end of the first and second stages included the use of gradual muscle strength exercises for the foot, which is represented by the use of resistance exercises. Using many tools, including rubber bands, therapist resistance, and exercises with devices of varying intensity, the rehabilitation program contained many diverse rehabilitation exercises to develop the muscular strength of the muscles working on the ankle joint, starting from fixed (isometric) to moving (isotonic), which in turn leads to an increase in cross-section. The physiological function of the muscle then increases the size of the muscle fibers (36).

This is what Matkula 2002 confirmed that a training system with gradual exercises from constant strength to the use of weights, elastics, and rubber has a positive effect on the muscular strength of the muscles working on the ankle joint (38).

The balance exercises that the researcher used in the second stage also played a major role in developing the muscle strength of the muscles working on the ankle joint.

This is confirmed by Ahmed Omran's study that balance exercises may bring about positive changes in muscle activity or muscle balance between the muscles surrounding the affected joint by increasing the efficiency of the sensory receptors, which leads to increased joint balance (20).

Developing muscle strength leads to increased muscle mass and strengthens connective tissues. The use of muscle strength exercises in rehabilitation programs leads to the expansion of blood capillaries, which helps expand arterial blood pressure in the working muscle and increase muscle fibers as well as mitochondria in the muscle (15).

Mervat Youssef Al-Sayyid (1998) indicates that rehabilitation is considered treating and training the injured person to improve their functional abilities or return them to their normal condition before the injury occurs in the shortest possible time, using rehabilitation and physical therapy methods that are appropriate to the type and severity of the injury. Rehabilitation programs include three basic short-term goals. The range is: controlling pain – maintaining and improving flexibility – and returning or increasing strength (16). This is what the researcher sought in this study.

The results of this study are consistent with the study of Abdel Salem Bakr Abdel Salem (2019) (10) and the study of Abdel Basset (2014) (14), the study of Muhammad Mohsen Ismail (2015) (17), the study of Ahmed Hamdi Muhammad Ali (2012) (18), the study of Stensrud et al. 2015 (37), and the study of Muhammad Ahmed Refaat (2014) (19) which indicated an improvement in muscular strength and functional performance in Post-tests.

These results confirm the validity of the second research hypothesis, which states: There are statistically significant differences between the pre-and post-measurements in the foot muscle strength variable, in Favor of the post-test.

The third research hypothesis: the degree of pain sensation

Table (3): Results of the sample t-test to identify the effect of the rehabilitation program on ankle joint injury among football players, n=6.

Measurements	Measure unit	Pre-test		Post-test		T Value	Sig	Indication
		Mean	Std. Deviation	Mean	Std. Deviation			
Degree of pain								
Planter flexion	degree	7.33	1.63	2.16	0.40	7.90	0.00	Morale
Dorsiflexion	degree	7.83	1.47	2.00	0.00	9.709	0.00	Morale
Inversion	degree	8.16	1.72	2.16	0.40	9.489	0.00	Morale
Eversion	degree	7.33	1.36	2.00	0.00	9.562	0.00	Morale

Table No. (3) shows that there are significant and statistically significant differences between the pre-and post-tests of the sample and in favor of the post-test to test the degree of pain. The researcher attributes the reason for this to the nature of the rehabilitative curriculum prepared by the researcher, which included strength, flexibility, and balance exercises, and exercises using rubber bands. The researcher believes that rehabilitative exercises were beneficial in reducing the intensity of pain as well as improving blood circulation within the muscle and increasing the activity of enzymes, which helped the injured to achieve these significant differences, as well as in strengthening the muscles working on the ankle joint and then developing the range of motion of

the joint and thus the recovery of the injured person. To what he was before the injury

This is what was indicated by Mackenzie (1989), who confirmed that strength and flexibility exercises complement the rehabilitation programs, as they lead to increased blood flow to the area of injury and help in removing waste and remnants of the injury while reducing pressure, which in turn led to pain relief (125:40).

Muhammad Qadri (2005) also points out that integrated rehabilitation therapy positively strengthens and relaxes tense muscles, stimulates blood circulation, improves muscle tone, and alleviates pain (22.21).

This is consistent with the study of Suad Abdul Hussein (2010) that applying the rehabilitation program and the flexibility and stretching exercises it contains, which work to increase the range of motion, positively affects the vanishing of pain (22).

Conclusions

–The rehabilitation program using therapeutic rehabilitative exercises and accompanying methods has a positive effect on developing the range of motion of players with first– and second–degree external ankle sprains.

–The rehabilitation program using therapeutic rehabilitative exercises and accompanying methods has a positive effect on developing the muscular strength of the extensor muscles of players with first– and second–degree external ankle sprains.

–The rehabilitation program using therapeutic exercises has a positive effect on developing the muscle strength of the flexor muscles for athletes with first– and second–degree external ankle sprains.

–The rehabilitation program reduces pain and restores the ankle joint's functional condition as before the injury occurrence.

Recommendations

In the light of the results extracted and within the limits of the sample area of study, the researcher recommends the following:

–Stress on muscle strength exercises throughout the season to protect the joints from sprains.

–Pay attention to stretching and flexibility exercises for all joints of the body during the warm-up.

–Conducting therapeutic exercises and appropriate physical therapy methods for such injuries through specialized cadres in the field of rehabilitation and injuries due to their major role in restoring healing and preventing the recurrence of the injury.

–The necessity of establishing specialized rehabilitation centers in the field of rehabilitation and physical therapy, especially for sports clubs.

–Conduct further research in the field of rehabilitation and other common injuries in futsal.

–Coaches and physical rehabilitation specialists must pay attention to good warm-up and stretching exercises for the adductor muscles and the muscles surrounding the ankle before starting training and matches to prevent injuries.

–Paying attention to injured athletes and conducting the necessary medical examinations for them so that the injury does not develop and becomes chronic in the player.

References

- Bakri, M. Q. (2001). Sports rehabilitation, sports injuries, and first aid, Cairo.
- Eliwa, M. A. (2002). Sports injuries between prevention and treatment, first edition, Zagazig.
- Ali, A. H. M. (2012). A physical rehabilitation program for the lower limb using a proposed device for static exercises for a torn lateral ligament injury of the ankle joint (master's thesis). Faculty of Physical Education for Girls, Alexandria University.
- Riyad. O. and Hassan, I. (1991). Sports Medicine and Physical Therapy, 1st edition, Cairo, Al-Kitab Publishing Canter.
- Qutb, M. H., Mansour, D. A. H, and Ezzat. R. H. M. (2008). "Sports Injuries and Movement Therapy", Faculty of Physical Education, Helwan University, Cairo.
- Khater, A. and Al-Beik, A. (1999). Measurement in the sports field. 4th edition, Dar Al-Kitab Al-Hadith, Kuwait, 573.
- Samia, K. M. (2009). Common Sports Injuries Lecture Series, eighth lecture, College of Physical Education for Girls / University of Baghdad.
- Tawfiq, F. A. H. (2005). The importance of physical exercises in treating posture deformities, Dar Al-Wafa for Printing and Publishing.
- Khalif, I. K. and Iftikhar, A. A. (2019). The effect of balance exercises accompanied by some therapeutic methods in rehabilitating ankle joint sprains for players of first-class football clubs V31 (4) 929.

- Abdel Salem, B. A. S. (2019). The effectiveness of physical and aquatic rehabilitation for chronic foot joint sprain injury for emerging athletes, (unpublished master's thesis), Faculty of Physical Education for Boys, Helwan University.
- Abdel Qader, M. O. (2016). Establishing a rehabilitation program to improve cases of functional instability after ankle joint sprains for athletes, (unpublished master's thesis), Faculty of Physical Education for Boys, Alexandria University.
- Abdel Maboud, A. A. Q. (2001). The effect of a proposed rehabilitation program on sprained foot joints among players of some team sports, (unpublished master's thesis), Faculty of Physical Education for Boys, Helwan University.
- Othman, F. (2000). Sports injuries and their first aid for athletes and everyone. Dar Al-Fikr Al-Arabi, Cairo.
- Abdel Basset, M. M. M. (2014). The effect of a rehabilitation program for muscle strains and sprains among junior football players. (Unpublished master's thesis), Department of Sports Health Sciences, College of Physical Education for Boys, Benha University.
- Abu Al-Ela, A. A. F. (1998). Sports training – physiological foundations. 2nd edition, Dar Al-Fikr Al-Arabi.
- Al-Sayyed, M. Y. (1997). The effect of a proposed program using water exercises to rehabilitate the muscles working on the knee joint without anterior cruciate ligament surgery.
- Ismail, M. M. (2015). The effect of a physical rehabilitation program on ankle sprain injury among tennis juniors (unpublished master's thesis). Faculty of physical education for boys, Helwan University.

- Ali, A. H. M. (2012). A physical rehabilitation program for the lower extremity using a proposed device for operative exercises for a torn lateral ligament injury of the ankle joint (master's thesis). Faculty of Physical Education for Girls, Alexandria University.
- Refaat, M. A. (2014). Evaluation of the results of rehabilitation programs for the treatment of the external ankle ligament (master's thesis). Published, Faculty of Physical Education for Boys, Helwan University.
- Omran, A. A. F. (1998). The effect of a program on the posture mechanics of surgically treated lumbar disc herniation patients (master's thesis). College of Physical Education for Boys, Alexandria.
- Bakri, M. Q. (2005). Sports injuries and sports rehabilitation, Al-Manar Printing House, Cairo.
- Abdel Hussein, S, et al. (2010). Using body methods during the warm-up period to prevent the risk of injury.
- Ekstrand, J. (2013). Keeping your top players on the pitch: The key to football medicine at a professional level. Br J Sports Med; 47:723–724. doi: 10.1136/bjsports-092771.
- Carling, C., McCall, A., Le Gall F. and Dupont, G. (2016). The impact of short periods of match congestion on injury risk and patterns in an elite football club. Br J Sports Med. Jun; 50(12):764–8.
- Drawer, S. and Fuller, C.W. (2002). Evaluating the level of injury in English professional football using a risk-based assessment process. Br J Sports Med, 36(6):446–451. Doi: 10.1136/bjism.36.6.446.
- Rahnama, N., Reilly, T., Lees, A. and Lees A. (2002). Injury risk associated with playing actions during competitive soccer. Br J Sports Med, 36:354–9.

- Pfirrmann, D., Herbst, M., Ingelfinger, P., Simon, P. and Tug, S. (2016). Analysis of Injury Incidences in Male Professional Adult and Elite Youth Soccer Players: A Systematic Review. *J Athl Train*, 51: 410–424.
- Barnes C, Archer, D.T., Hogg, B., Bush, M. and Bradley, P. S. (2014). The evolution of physical and technical performance parameters in the English Premier League. *Int J Sports Med*. Dec; 35(13):1095–100.
- Yeung, M., Chan, K., So, C. and Yuan, W. (1994). An epidemiological survey on ankle sprain. *British Journal of Sports Medicine*. 28(2):112–116.
- Halabchi, F. and Hassabi, M. (2020). Acute ankle sprain in athletes: Clinical aspects and algorithmic approach. *World J Orthop*.18;11(12):534–558.
- Fong, D.T., Hong, Y., Chan L.K., Yung, P. S. (2007). and Chan, K.M. A systematic review on ankle injury and ankle sprain in sports. *Sports Med*. 37:73–94. doi: 10.2165/00007256-200737010-00006.
- Yabroudi, M. A. and Irrgang, J. J. (2013). Rehabilitation and return to play after anatomic anterior cruciate ligament reconstruction. *Clin Sport Med*. 32(1): 165–75.
- Gregory, M. G., Thomas, W. K. and Douex, Al. T. (2009). Neuromuscular control and ankle instability *PM R*. Apr;1(4):359–65.
- You–Jou. H. (2015). Neuromuscular control and rehabilitation of the unstable ankle *World J Orthop*. Jun 18;6(5):434–8.
- Michel, P. J., Van den, B., Oostra R. J., Golanó, P. and Van Dijk, C. N. (2008). The anatomy about injury of the lateral collateral ligaments of the ankle: a current concepts review. *Clin Anat*. 21:619–626.

- Jeremiah O'D., Fearghal, K. and Eamonn, D. (2011). Effect of a 6-week dynamic neuromuscular training program on ankle joint function: A Case report. *Sports Med Arthrosc Rehabil Ther Technol.* Jun 9:3:13. doi: 10.1186/1758-2555-3-13.
- Stensrud S., Risberg, M. and Roos, E. (2015). Effect of exercise therapy compared with arthroscopic surgery on knee muscle strength and functional performance in middle-aged patients with degenerative meniscus tears: *Am J Phys Med Rehabil.* Jun;94 (6);460–73.
- Mattacola, G. G. and Dwyer, M. R. (2002). Rehabilitation of the ankle after an acute sprain or chronic instability. *Journal of athletic training.* 37. (4):432.
- Anderson, B. (1989). *Stretching.* Shelter Publications, inc. California, USA, 322.
- Mackenzie, R. (1989). *Treat your Own Back, Orthopedic Physical Therapy Products.*
- Carl, G. M. and Maureen K. D. (2002). Rehabilitation of the Ankle After Acute Sprain or Chronic Instability; *J Athl Train.* Oct–Dec; 37(4): 413–429.

–Delgado, D. A., Lambert, B .S., Boutris, N., McCulloch, P. C., Robbins, A. B., Moreno, M. R. and Harris, J. D. (2018). Validation of digital visual analog scale pain scoring with a traditional paper–based visual analog scale in adults. Journal of the American Academy of Orthopaedic Surgeons. Global research & reviews. Mar;2(3).

–Shultz, S. J., Hougum, P. A. and Perrin, D. H. (2016).

Examination of Musculoskeletal Injuries, 4th Edition, p361.

–FIFA. FIFA bigcount2006:270millionpeopleactivein football.

www.fifa.com/aboutfifa/media/newsid=529882.html.

–<https://bodyfocusphysioclinic.com.au/5-most-common-futsal-injuries-how-to-prevent-them>.