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Impact of Rehabilitation Workouts Using Rubber Bands and Resistance Bands on the Recovery from Ankle Sprain Injuries in Some Team Players in Misan Governorate

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Abstract: *This paper includes an introduction, significance, methodology, analysis, and conclusions. At the beginning, ankle sprain is introduced, along with the related injuries, causes, and effects. This study is significant as it proposes a rehabilitation method to treat ankle sprain injuries using rubber bands and resistance bands. The statement of the research emphasizes the prevalence of ankle sprain injuries and the corresponding rehabilitation methods using conventional workouts, which may involve loads and might be undesirable, as it causes certain complications. Therefore, this paper aims to design a method to help players and athletes recover from these injuries using rubber bands and resistance bands. Accordingly, the paper hypothesizes that the proposed rehabilitation method effectively treats ankle sprain injuries using rubber bands and resistance bands, with rubber bands being remarkably effective in that respect. Data included ten players with ankle sprain injuries who underwent a recovery using the proposed rehabilitation method from April 20, 2024, to July 1, 2024, at the physiotherapy center in Misan Governorate, Iraq. This study uses an experimental method. Thus, an experimental design encompassing two tentative (equivalent) groups with pretests and post-tests has been designed. Data collection included devices, equipment, measurements, pilot tests, the proposed rehabilitation method, and statistical software. The paper elaborates on research findings by classifying them into tables, graphs, and illustrative figures. Additionally, the paper scientifically analyzes and discusses the results based on previous studies and relevant literature. Finally, the paper develops conclusions, suggestions, and recommendations. Following data analysis and result discussion, the paper developed conclusions that mostly address how the proposed rehabilitation method, which utilizes rubber bands and resistance bands, effectively and positively treats ankle sprain injuries by improving thigh circumference, muscle strength, angles of movement, and degree of pain. Also, the study finds that the proposed rehabilitation method, which utilized rubber bands, is noticeably more effective in the enhancement of muscle strength.*

Keywords: *Rehabilitation Workouts, Ankle Sprain Injury, Rubber Bands, Resistance Bands, Muscle Strength Recovery*

Introduction

Rehabilitation workouts in general, and in sports in particular, are the most influential means of recovery for injured players. There are clear indications that rehabilitation workouts lead to many effects in the athletes' bodies, including speeding blood clot drains, preventing internal intra-joint bleeding, making muscles and joints recover articulations quickly, and restoring muscular abilities to normality.

When injured athletes return to regular play without any physical rehabilitation, they make a grave mistake. Regular and continuous returns to plays, exercises, or workouts could lead the injuries to double, with the related athletes possibly feeling no pains despite

the new, remarkably visible form of injury. Ultimately, recurrent returns cause extremely painful injuries given that most athletes are vulnerable to various physical injuries, which seriously prevent athletic development.

Therefore, such physical injuries are likely to increase, seeing as the wider demand on the required plays with their loads is steadily increasing. This is best expressed as highly intense recurrences. Generally, these injuries are mainly caused by ill-managed training; exercise loads that are incompatible with athletes' capabilities, known as training errors, moving on multi-height surfaces; use of medical formulas, and unsuitable sport equipment and gear used to exercise rough play.

Ankle joints are highly exposable to a variety of physical injuries, including ankle sprain injury. Ankle sprain injury (ASI) is common in these joints, particularly in events and games that require quick stops or sudden changes of direction. Being the central mass of the whole body, ankles function as an energy provider for legs when vibrating. ASIs are often treated with severity-sensitive medical interventions, medicines, electro-medical means, such as heat and x-rays, or physical workout-based rehabilitations.

Rehabilitation workouts are a set of fixed and active moves that are inspired by the philosophical and logical foundations of various disciplines and fields, including sports medicine, anatomy, physical workout, measurement, tests, and physiology. These motor and physical practices are provided for athletes with ASI to restore affected parts to normality and functionality. Moreover, ASI can be treated with resistance bands using cutting-edge equipment that can enable joints to resist injury as long as the motor path of the affected parts. Therefore, these practices are crucial in the rapid recovery from ASIs.

This study is significant as it proposes certain workouts to help athletes recover from ASI using rubber bands and resistance bands. The proposed rehabilitation method (PRM) suggested in this paper can help athletes recover from injuries that may prevent them from engaging in their own sports, given the positive and attractive advantages of these devices. These advantages are easy performance, controllability, cutting-edge and state-of-the-art equipment, availability in bright colors, and the ability to get athletes to recover from injuries and return to normality as quickly as possible. These factors drive athletes with ASI to use them continuously.

Statement of the Problem

ASI and the accompanying suffering and pain can limit motor and physical activities and cause disability in athletes. These pains commonly increase when the ankle joint is bent and stretched out for any movement. After reviewing some physiotherapy-related literature, the researcher found that injury rehabilitation is often done with therapeutic workouts using traditional methods, such as weights, although it could be undesirable for injured athletes. Athletes with ASI usually prefer a faster and easier way to work out, such as rubber bands and resistance ropes, given their physical and psychological effect on the psychology of the injured athletes. Therefore, this paper, utilizing these practices, proposes rehabilitation workouts based on evidence-proven, practically performed, and scientifically informed methodologies. PRM principally strengthens circum-articular muscles using

gradually intense resistances and reduces the rehabilitation period. Being effective and cutting-edge, athletes with ASI opt to work out with resistance bands and rubber bands.

Objectives

This study aims to:

1. Designing a rehabilitation method using rubber bands and resistance bands to rehabilitate sprained ankle injuries in some team game players in Misan Governorate.
2. Recognizing the impact of that rehabilitating method, which relies on rubber bands and resistance bands, on the treatment of sprained ankle injury in some team game players in Misan Governorate.

Hypotheses

There is a positive impact of the rehabilitating method, which is based on rubber bands and resistance bands, on the recovery from ankle sprain injuries in some team game players in Misan Governorate.

Data and Sample

a. **Human Samples**

Some players with sprained ankle injury who are involved in some team games in Misan Governorate.

b. **Temporal Field**

Rehabilitation from April 20, 2024 to July 1, 2024.

Spatial Field1-3-5

Physiotherapy Rehabilitation Center in Misan Governorate, Iraq

2-Research methodology and field procedures

Methodology

This research utilizes an experimental approach with an experimental design conducted with two experimental groups (equivalent groups) with pre- and post-testing, as it is the appropriate way to solve the problem through hypothesis reliability and problem description.

Data and Sample

The sample included 12 players with ASI aged 20 to 32 years, from whom the researcher chose a representative sample. As Mahjoob (2002) stated, "representative sampling is the part that represents the whole or the original sample on whom researchers conduct their analysis" (p.164). Therefore, the researcher deliberately selected a sample of these players because of the possibility of controlling their research variables more precisely than other samples. Thus, the final sample included 10 players with ASI. The researcher formulated consistency for the sampled athletes in terms of height, weight, age, training duration, and injury type using the sprain coefficient. The results showed that the affected athletes were normally distributed among variables, as the sprain coefficients ranged

around (±1), which indicates that the athletes were distributed normally across the variables, as shown in Table (1) below.

Table (1) Consistency of Sampled Athletes

Variable	Unit	Mean	SD	Mode	Sprain Coefficient
Height	Meter	176.34	5.61	170	**0.734**
Weight	Kilo	69	4.07	65	**0.491**
Age	Year	24	1.30	19	**0.769**
Training Duration	Month	37.50	3.33	36	**-0.150**
Injury Type	**Ankle Joint Sprain**				

Data Collection

To achieve the research objectives and obtain accurate and correct results, the following methods and procedures have been used.

a. Sampling Means

1.Arabic and foreign references and resource materials. 2.Testing and measurement

3.Personal interviews. 4.Measurement results registration form .5.Injured player data registration form. 6.Assistant personnel

b. Auxiliary Equipment and Devices

1.A Chinese made HP laptop . 2.A Nikon D7100 camera. 3.1 Goniometer measure motion range .4.1 Dynamometer to measure force . 5.1 digital French made electronic stopwatch

6.10 German made THERABAND® rubber bands . 11.Chinese made resistance bands (1 x 3 m) .12. Measuring tape. 13.Multi-height benches. 14. Pillows

Procedures

In order to produce an accurate work by determining the number of athletes with ASI and identifying the real conditions encompassing physical and human aspects representing due scientific research designs, the researcher specified the available methods and equipment that can be used by the Directorate of Sports Medicine. This was done through interviews with the sports physicians and rehabilitation practitioners. Also, athletes with ASIs were interviewed to find whether they consented to recover from ASI using PRM and whether they were ready to apply PRM to recover from physical injuries.

Determination and Selection of Measurements

After reviewing many scientific sources, references, and previous studies on sport and physical rehabilitation, and conducting personal interviews to choose the measurements for measuring the variables considered appropriate to the nature of the sample and the type of the injury, the researcher identified and selected the following measurements:

1.Thigh circumference. 2.Muscle strength. 3.Angle of motion. 4.Degree and severity of pain

Thigh Circumference

Purpose: To determine the size of the femoral muscles of the affected limb in their transverse circumference (Naji & Ahmed, 1984).

Procedures: The measurement is done using a measuring tape. The method is to fix a point on the lower third from the upper edge of the patella bone upwards by 15 cm, after which the muscle circumference measurement is taken.

Recording: The injured player records the thigh circumference in centimeters.

Muscular Strength of Lower Limbs

Purpose: To measure the maximum strength of the femoral muscles (Alawi & Radhwan, 1982).

Procedures: The measurement is done using a dynamometer to measure the maximum strength of the material and flexor muscles of the knee and thigh joints.

Recording: The injured athlete records the amount of force in kilograms.

Angle of Motion

Purpose: To measure the angle of the joint (Al-Hazzaa, 2009).

Procedures: The measurement is done using a goniometer, which consists of a protractor with two arms, one of which is fixed in a parallel direction and adjacent to the fixed part of the organ connected to the joint, and the other, the moving arm, is fixed in a parallel direction and adjacent to the moving part of the joint. The injured person lies on the ground, fixing the goniometer on the lateral side of the knee, then fixing both ends of the device, after which the injured person raises the injured leg and brings it closer to the posterior femoral muscles.

Recording: The injured player records a reading as close as the injured player can reach in the corner.

Degree and Severity of Pain

Most studies on the measurement of pain intensity and severity made no mentions of how to accurately and scientifically measure these bodily injuries. Rather, previous literature on these measurements heavily relied on guess-made therapy or research where an injured athlete' pain is measured according to previously used forms, including the optical symmetry measurements and pain degree forms.

Therefore, the researcher measured the injury, especially hinge joints, in a precise scientific way that shows the true degree of pain. In light of these analyses, pain intensity levels were determined according to these scores, which were given by physiotherapists, physiatrists, and sports professionals.

Purpose: To measure the degree and severity of injury-made pain.

Procedures: From a prone position on the abdomen, the affected person bends the affected leg towards the posterior femoral muscle until he feels pain and the affected person is unable to bend further.

Recording: The therapist records the degree of pain using a modified goniometer graduated from 3 to 18. After installing the two arms of the device, one of which is fixed in a parallel direction and adjacent to the fixed part of the organ connected to the joint, and the other, the moving arm, is fixed in a parallel direction and adjacent to the moving part of the joint. As for the severity of pain for the affected man, it is illustrated in Table (2) below:

Table (2) Pain Degrees and Equivalent Pain Intensities

Pain Degree	Pain Intensity
From 16 to 18	**Very Intense**
From 13 to 14	**Intense**
From 10 to 12	**Severe**
From 8 to 9	**Mild**
From 5 to 7	**Minor**
4	**Painless**

Pilot Test

A pilot test is a preliminary experiment that is conducted on a small sample before conducting the main analysis to choose research methods and tools (TAAL, 1984). Pilot tests identify positive and negative aspects likely to develop later to avoid them and develop, delete, or alter some steps; ensure the suitability of the proposed time period for each PRM course; ensure that devices and tools work safely; and identify the validity of the measurements used and the extent of the researcher's and the work team's ability to perform and implement them. Therefore, a pilot test was conducted on 2 athletes with ASI on Tuesday, May 9, 2024. This test aimed to:

1. Verifying the accuracy and safety of the devices and tools used.
2. Checking the suitability and appropriateness of the measurements used, and revealing the difficulties facing the sample and the researcher when applied.
3. Calculating the time it takes for different measurements to be applied to benefit from this when conducting the main research experiment.
4. Training assistants on how to apply tests and how to record grades.
5. Taking the safety of the injured athletes into account when performing measurements.

Pretests

The researcher conducted pretests on 10 athletes with ASIs on Wednesday, May 10, 2024, at 10 AM in the Physiotherapy Hall of the Physical Therapy Section/ Misan. On the first day of the pretests, the researcher recorded the biometric data of the affected athletes, namely height, weight, age, training period, and muscle strength, as well as the results of measuring the angle of movement, degree and severity of pain, and thigh circumference. The researcher briefly explained how the measurements were performed and sequenced. Also, the researcher recorded all the measurement conditions, including time and space, in order to re-provide similar conditions when performing post-tests.

The Suggested PRM

The suggested PRM, after being designed according to previous studies, relevant theories, and physical therapy-related Arab and foreign sources, has been reviewed by

experts (See Appendix 1). This method included workouts specifically designed to rehabilitate athletes with ASIs using rubber bands and resistance ropes for 6 weeks, from Thursday, May 11, 2024, to Sunday, June 23, 2024, in 3 courses a week (Sunday, Tuesday, and Thursday). These workouts are to strengthen the ankle joint muscles, lengthen ankle strength, increase range of motion, and try to return ankle range of motion to normal and in all directions of motion. Also, PRMs included a six-week gradual approach to the intensity of physical load and a gradual approach to the difficulty of performing exercises. These PRMs started with exercises with bands with light resistance to bands with high resistance. As for resistance bands, the progression was initiated through simple tension to ropes with high resistance.

Post-tests

After the PRM implementation was completed, post-tests were conducted on the injured athletes on Monday, June 24, 2024, at 10:00 AM in the Physiotherapy Hall of the Physical Therapy Section/ Misan Governorate, Iraq. Therefore, the researcher recorded the measurements of muscle strength, angle of movement, degree and intensity of pain, and thigh circumference. Additionally, the researcher provided the same conditions, specifically place, time, tools, implementation method, and the assistant personnel, that conducted the pretests.

Statistical Means

To process statistical calculations, a statistical software, namely SPSS (Statistical package for the social sciences), has been used.

Result and Discussion

Table (3). Mean (M), Standard Deviation (SD), T-squared Value (T2), T-tabular Value (TTV), Significance (Sig.) of the Pretests and Post-tests of the Experimental Groups (Rubber Bands)

Variable and Tests	Pretest		Post-test		T-squared	T - tabular	Sig.
	M	SD	M	SD			
Thigh circumference	1.33	4.21	5.64	7.72	8.79	2.38	**Significant**
Muscle strength	1.45	2.16	2.64	1.33	11.32		**Significant**
Angle of movement	05	1.05	8	4.09	21.51		**Significant**
Degree of pain	0	1.38	5	0.40	20 2.51		**Significant**
T-tabular Value at Freedom = (Sample=1) = (3) at Sig. 0.05							

Table (3), which illustrates statistical findings, demonstrates measurement results of thigh circumference, muscle strength, angle of movement, and degree of pain for the

experimental group, which used rubber bands in pretests and post-tests. The means in pretests were 41.33, 21.45, 105, and 10, respectively, with SDs amounting to 7.21, 1.16, 4.05, and 0.38, respectively, while the means in post-tests amounting to 45.64, 42.67, 48, and 4.5, respectively, with SDs were (6.72, 2.33, 4.09, and 0.40), respectively. To find out the differences between pretests and post-tests for the experimental group, which used rubber bands, a T-test was used to calculate the associated samples. The T-squared values of this test were 8.79, 11.32, 21.51, and 22.51, respectively, all of which are greater than their T-tabular value (2.38) at freedom of (3) and Sig. of (0.05). These results confirm that the differences are significant and are in favor of post-test results.

Discussion and Analysis of Pretests and Post-tests of the Experimental Groups (Rubber Bands)

Table (4). Means (M), Standard Deviations (SD), T-squared Value (T2), T-tabular Value (TTV), Significance (Sig.) of the Pretests and Post-tests of the Experimental Groups (Resistance Bands)

Variable and Tests	Pretest		Post-test		T-squared	T - tabular	Sig.
	M	SD	M	SD			
Thigh circumference	40.67	2.11	44.71	1.97	5.03	2.38	Significant
Muscle strength	19.77	0.77	38.10	2.25	21.39		Significant
Angle of movement	113	8.37	40.50	2.88	22.46		Significant
Degree of pain	10.8	0.91	4.07	0.28	22.46		Significant
T-tabular Value at Freedom = (Sample=1) = (3) at Sig. 0.05							

Table (5) Table (4), which illustrates statistical processing of data, demonstrates the measurement results of thigh circumference, muscle strength, angle of movement, and degree of pain for the experimental group (which used rubber bands) in pretests and post-tests. The means of these tests in pretests were 40.67, 19.77, 113, and 10.8, respectively, with SDs were 2.11, 0.77, 8.37, and 0.91, respectively.

The means in post-tests amounted to 44.71, 38.10, 40.50, and 4.07, respectively, with SDs amounting to 1.97, 2.25, 2.88, and 0.28. To find out the differences between pretests and post-tests for the experimental group, which used resistance bands, a T-test was used to calculate associated samples. The T-squared values of this test were 5.03, 21.39, 22.46, and 22.46, respectively, all of which are greater than their T-tabular value (2.35) at degree of freedom (3), and Sign. at (0.05). These frequencies indicate that the differences are significant and are in favor of post-test results.

Discussion and Analysis of Post-test Results of the two Experimental Groups (Rubber Bands and Resistance Bands)

Table (5). Means (M), Standard Deviations (SD), T-squared Value (T2), T-tabular Value (TTV), Significance (Sig.) of the Post-tests by the Two Experimental Groups

Variable and Tests	Rubber Band Pretest		Resistance band Post-test		T-squared	T - tabular	Sig.
	M	SD	M	SD			
Thigh circumference	45.64	6.72	44.71	1.97	0.03	1.94	**Significant**
Muscle strength	42.67	2.33	38.10	2.25	2.71		**Significant**
Angle of movement	48	4.09	40.50	2.88	1.10		**Significant**
Degree of pain	4.5	0.40	4.07	0.28	1.10		**Significant**
T-tabular Value at Freedom = (Sample=1+Sample 2-2) = (6) at Sig. 0.05							

Table (5) shows post-test results for measurements for the two experimental groups, which used rubber bands and resistance ropes. The means of the rubber band group in the dimensional measurement of the research variables, which are thigh circumference, muscle strength, angle of movement, and degree of pain, were 45.64, 42.67, 48, and 4.5, respectively, with SDs amounting to 6.72, 2.33, 4.09, 0.40. The means of the resistance rope group in post-test results for the research variables, which are thigh circumference, muscle strength, angle of movement, and degree of pain, were 44.71, 38.10, 40.50, and 4.07 respectively, with SDs were 1.97, 2.25, 2.88, and 0.28 respectively. To find out the differences between the post-test results of the two experimental groups in the research variables, the researcher used the T-test method to calculate independent samples. The value of this test calculated in measuring muscle strength amounted to (2.71), which is greater than the T-tabular value of (1.94) at the degree of freedom (6) and at significance (0.05). This confirms the significant differences between the two groups in muscle strength and in favor of the elastic band group. As for the T-test results for thigh circumference, angle of motion, and degree of pain, they were 0.03, 1.10, and 1.10 respectively, all of which are smaller than their T-tabular value (1.94) at degree of freedom (6) and at the level of significance (0.05). These frequencies prove that the differences between the two groups are non-significant in these variables.

Discussion

Pretests and Post-tests of the Two Experimental groups (Rubber Bands and Resistance bands)

The results mentioned in Tables (4) and (5), which are the pretest and post-test results for the research variables, which are thigh circumference, muscle strength, angle of movement, and degree of pain, for the experimental group, which uses rubber bands and

resistance ropes, show significant cross-test differences in favor of post-tests. The reason for these significant differences is the type of exercises in which the researcher used rubber bands because of their effectiveness and major role in developing muscle strength, thigh circumference, angle of movement, and degree of pain, because these bands provide different and multiple resistances along the path of movement.

Therefore, these resistances were reflected in an increase in force in two directions: the first is muscular by increasing the muscle section, and the second is nervous by increasing motor units. This means mobilizing muscles, normalizing the nervous system, increasing the loads of exercises by providing the amount of nerve impulses needed for work, and strengthening the joint ligaments through band exercises. These results are consistent with Page and Ellenbecker (2019), who stated, "Rubber bands have a positive effect on muscle strength because they add resistance forward, backward, sideways, and in all directions, which is positively reflected in improving muscle performance and strengthening joint ligaments." In the same vein, McNeely and Sandler (2006) indicated that "rubber bands develop the level of muscle strength, improve the level of muscle balance, and activate some special muscles that cannot be activated thanks to devices."

As for the group of resistance ropes, the reason for the significant differences is the role of resistance ropes and the various standardized exercises that were used in qualifying and developing the research variables, which are thigh circumference, muscle strength, movement angles, and degree of pain, as Khalil (2010) confirmed that "the use of resistance rope exercises contributes to developing muscle tone and strength." These results were previously discussed in the development of muscle strength in both directions. In addition, these ropes have resistances that greatly help in rehabilitating the injury, as these properties provide supports that are in favor of performing rehabilitation exercises comfortably and contribute to facilitating the performance of flexibility and strength exercises in the affected joints and weak muscles affected by muscle weakness. Brody and Geigle (2009) indicated that these workouts contribute to the patient's relaxation during the treatment session, which reduces the risk of recurrence of the injury during rehabilitation.

Finally, it can be said that the exercises used in band-based PRM contributed greatly to the end of the tumor and joint pain resulting from injury by increasing the speed and amount of blood paid into the blood circulation, which worked to gradually get rid of the results of the injury. In addition, this method facilitates the possibility of movement as the tumor and pain disappear and increases the strength of the muscles and ligaments. These results were confirmed by Abdul-Hameed and Hassanain (1997) in resistance training, saying that "resistance exercises are characterized by the exchange of contraction and relaxation, and this results in an increase in the flow of oxygen-laden blood flowing to the muscular system and the occurrence of dilation in the blood vessels, which results in an increase in the flow of blood inside them, and that the increase in blood flow increases the elimination of work products during training and the result of sports injuries."

Similarly, Al-Jumaily (2025) posited that "The movement of the ankle joint is determined by the pain and swelling that occurs in it, which leads to a loss of efficiency in it. This develops if the injured person does not receive appropriate treatment and

rehabilitation for the injury, which in turn works to restore the mechanism of movement of the knee as a result of getting rid of the tumor that occurs in it and increasing the strength of the muscles working on it and the ligaments surrounding it."

Discussion of Post-test Results of the Two Experimental Groups (Rubber Bands and Resistance bands)

The frequencies stated in Table (5) above of the post-test results concerning the research variables (thigh circumference, muscle strength, movement angles, and degree of pain) for both groups demonstrate that there are no statistically significant differences between the two groups in thigh circumference, angle of pain, and degree of pain. The reason for these findings is that both PRM-based methods performed by the two experimental groups using rubber bands and resistance ropes improved these variables. Being effective rehabilitation boosters, these methods helped improve many physical and motor characteristics, enhance physical measurements, and decrease pain. Additionally, PRM is favored by athletes with ASIs, as it psychologically contributes to injured athletes' acceptance of using these workouts, on account of their easiness and distinction from other rehabilitation methods. These results are consistent with Page and Ellenbecker (2019), who reported that "rubber bands are advantageous over other methods in muscular strength and rehabilitation, and that rubber bands have an advantage over several methods given their ability to simulate muscles and develop muscle strength." (p.8).

Conclusion

Following the data analysis and the related discussions, the following conclusions have been drawn:

1. The rubber band-based PRM positively affects the rehabilitation of athletes with ASI through the development of physical variables, which are thigh circumference, muscle strength, movement angles, and pain degrees.
2. The resistance band-based PRM positively affects the rehabilitation of athletes with ASI through the development of physical variables, which are thigh circumference, muscle strength, movement angles, and pain degrees.
3. The enhancement of thigh circumference, muscle strength, movement angles, and pain degrees, through the remarkably noticeable differences between pretests and post-tests by the two experimental groups, confirms the effectiveness of the independent variable and the experimental control.
4. The duration of the independent variable, as represented by the number of PRM workouts performed by both research groups, was appropriate in creating adaptations that express the extent of development in the return of the injured athlete to the pre-injury level in the physical variables, which are thigh circumference, muscle strength, movement angles, and pain degrees.
5. The rubber bands and resistance bands are easy to use.

Recommendations

Based on the findings and results elaborated on above, the paper proposes the following recommendations:

1. The rubber band-based PRM suggested in this paper is necessary in the effectively positive recovery of athletes with ASIs, as it helps enhance thigh circumference, pain angles, and pain degrees in general, and muscle strength in particular.
2. The resistance band-based PRM suggested in this paper is necessary in the effectively positive recovery of athletes with ASIs, as it helps enhance thigh circumference, muscle strength, pain angles, and pain degrees. It also helps athletes with ASIs relax by providing a psychological comfort while working out.
3. Similar studies should be conducted on different samples at different times that involve different ages and different means to determine which means can better rehabilitate athletes with ASIs.

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