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Effect of Rehabilitative Exercises and Massage on the Ankle Strain Among Football Players in Hyderabad

Qasim Abdulhafedh Mahmood
Master of Physical Education
University College of Physical Education, Osmania University
University of Mosul, Iraq

ABSTRACT:
To outline rehabilitation concepts that are applicable to acute and chronic injury of the ankle strain, to provide evidence for current techniques used in the rehabilitation of the ankle strain, and to describe a functional rehabilitation program that progresses from basic to advanced, while taking into consideration empirical data from the literature and clinical practice. Important considerations in the rehabilitation of ankle strain injuries include controlling the acute inflammatory process, regaining full ankle range of motion, increasing muscle strength and power, and improving proprioceptive abilities. These goals can be achieved through various modalities, flexibility exercises, and progressive strength- and balance-training exercises. In this article, we discuss the deleterious effects of ankle injury on ankle-strain proprioception and muscular strength and how these variables can be quantifiably measured to follow progress through a rehabilitation program. Evidence to support the effectiveness of applying orthotics and ankle braces during the acute and sub acute phases of ankle strain rehabilitation is provided, along with recommendations for functional rehabilitation of ankle strain injuries, including a structured progression of exercises.Early functional rehabilitation of the ankle should include range-of-motion exercises and isometric and isotonic strength-training exercises. In the intermediate stage of rehabilitation, a progression of proprioception-training exercises should be incorporated. Advanced rehabilitation should focus on sport-specific activities to prepare the athlete for return to competition. Although it is important to individualize each rehabilitation program, this well-structured template for ankle rehabilitation can be adapted as needed.

Keywords: ankle-strain injury, ankle strain rehabilitation, flexibility exercises, training exercises.

INTRODUCTION

We all know about football. Kicking a ball with the foot is what we refer football game. Now adays football is one of the most popular sports in the world. "Soccer" is the other name of football. It has a long history. Ancient people started to play first

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football. During the 20th century various types of football are getting more popular like rugby, American football, Canadian football etc. We all know various forms of football are identified in history. Basically football is played by two teams. Each team consists of 11 players and extra players are waiting outside the line if any player injured or depends on coach's decisions to change the players. By scoring goals or points is the result of this game. Two teams try to goal their opposite components. In that case players only use their feet or body without using hands to play this game. Players are being required to move the ball by kicking, passing and carrying. There are many roles to play in this game. Players are must abide this role. They cannot hit any players. The total time of this game is 90 minutes, with the most scored team considered as a winner.A game played by two teams of 11 players each on a rectangular, 100-yard-long field with goal lines and goalposts at either end, the object being to gain possession of a ball and advance it in running or passing plays across the opponent's goal line or kick it through the air between the opponent's goalposts.

ANKLE STRAIN:

Ankle injuries are defined by the kind of tissue -- bone, ligament, or tendon -- that's damaged. The ankle is where three bones meet -- the tibia and fibula of your lower leg with the talus of your foot. These bones are held together at the ankle joint by ligaments, which are strong elastic bands of connective tissue that keep the bones in place while allowing normal ankle motion. Tendons attach muscles to the bones to do the work of making the ankle and foot move, and help keep the joints stable.A fracture describes a break in one or more of the bones. A sprain is the term that describes damage to ligaments when they are stretched beyond their normal range of motion. A ligament sprain can range from many microscopic tears in the fibers that comprise the ligament to a complete tear or rupture. A strain refers to damage to muscles and tendons as a result of being pulled or stretched too far.

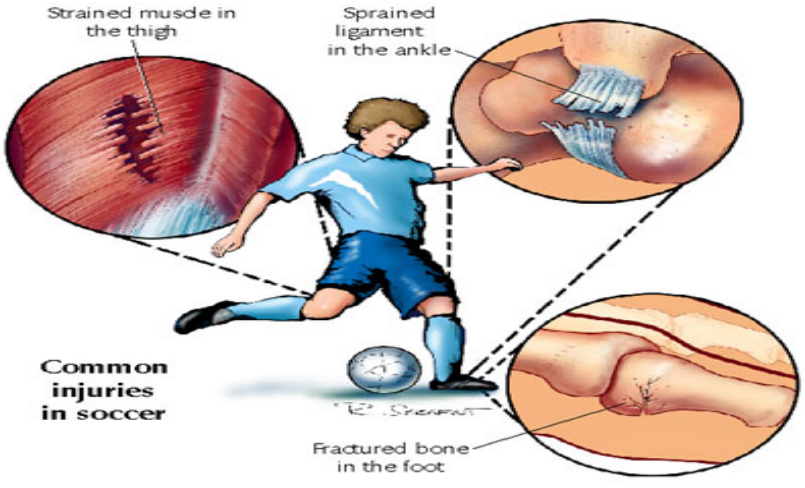

Figure 1: Knee Injury

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Muscle and tendon strains are more common in the legs and lower back. In the ankle, there are two tendons that are often strained. These are the personal tendons, and they stabilize and protect the ankle. They can become inflamed as a result of overuse or trauma. Acute tendon tears result from a sudden trauma or force. The inflammation of a tendon is called tendinitis. Microscopic tendon tears that accumulate over time, because of being repeatedly over stretched, and don't heal properly lead to a condition called tendinosis. Tendons can also rupture. Subluxation refers to a tendon that slips out of place.The ankle is complicated joint and it is commonly injured. For most of our evolution, animals with a backbone and skeleton (vertebrates), such as human beings, have walked on four legs. When mankind evolved to walk on just two legs the ankle was given quite a lot of extra work to do, both in weight bearing and in balance. It's perhaps not surprising, then, that the ankle is prone to strains, sprains and fractures. A **strain** refers to a painful condition of the ankle joint brought about by inflammation, overuse or simply awkward (or unbalanced) use. It includes inflammation of muscles and tendons such as the Achilles tendon at the back of the heel.A strain may be brought about by inflammation, overuse or simply awkward (or unbalanced) use. It includes inflammation of muscles and tendons such as the Achilles tendon at the back of the heel. It also includes overstretching or tearing of muscle fibres. Most strains occur either because the relevant part has been stretched beyond its limits, or it has been forced to pull (contract) too strongly. The severity of a muscle strain is graded into:

- First-degree strain - a mild strain when only a few muscle fibres are stretched or torn. The injured muscle is tender and painful, but has normal strength.
- Second-degree strain - a moderate strain with a greater number of injured fibres. There is more severe muscle pain and tenderness. There is also mild swelling, some loss of strength, and a bruise may develop.
- Third-degree strain - this strain tears the muscle all the way through. There is a total loss of muscle function.

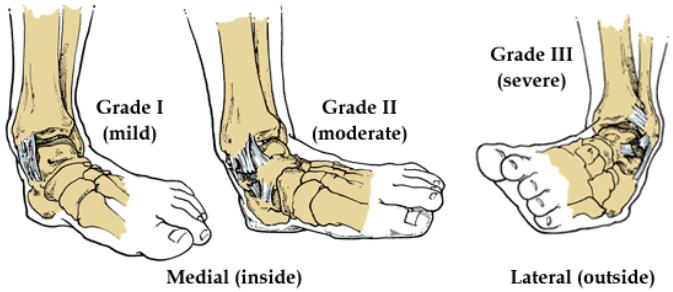

Figure 2: Ankle injury gradings

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Strains

A strain is an injury to a muscle and/or tendons. Tendons are fibrous cords of tissue that attach muscles to the bone. Strains often occur in your foot, leg (typically the hamstring) or back.Similar to sprains, a strain may be a simple stretch in your muscle or tendon, or it may be a partial or complete tear in the muscle-and-tendon combination. Typical symptoms of a strain include pain, muscle spasm, muscle weakness, swelling,inflammation, and cramping.A severe hamstring injury where the tendon has been torn from the bone.Soccer, football, hockey, boxing, wrestling and other contact sports put athletes at risk for strains, as do sports that feature quick starts, such as hurdling, long jump, and running races. Gymnastics, tennis, rowing, golf and other sports that require extensive gripping, have a high incidence of hand sprains. Elbow strains frequently occur in racquet, throwing, and contact sports.The recommended treatment for a strain is the same as for a sprain: rest, ice, compression and elevation. This should be followed by simple exercises to relieve pain and restore mobility. Surgery may be required for a more serious tear.

Treatments:

Your healthcare professional will advise. The advice may typically include:

- Do not stop moving the joint. Avoid doing anything that causes much pain, but gently get the joint moving again. The aim is to get the joint moving in normal directions, and to prevent it becoming stiff.
- Consider wearing a joint support until symptoms have gone. There are various forms of supports which can be used - from an elasticized bandage to a specialised brace. The aim is to give some support to the joint whilst the damaged ligament is healing, but to allow the joint to move to a reasonable degree.
- Physiotherapy may help for more severe sprains, or if symptoms are not settling. A physiotherapist can advise on exercises and may give heat, ultrasound, or other treatments. The aim of physiotherapy includes:
    - To get the joint back to a full range of normal movement.
    - To improve the strength of the surrounding muscles. The stronger the muscles, the less likely it is that a sprain will happen again.
    - Improving proprioception. This means the ability of your brain to sense the position and movement of your joints. Good proprioception helps you to make immediate, unconscious minor adjustments to the way you walk when walking over uneven ground. This helps to prevent further sprains, and is achieved through special exercises.

Preventing Ankle Strains:

The ankle is the most commonly sprained joint as it faces great challenges for weight bearing and

balance, particularly when moving fast over uneven ground. You can help to prevent ankle sprains by wearing boots that give ankle support rather than shoes when hiking across country or rambling over hills and uneven ground. Exercises to build up the muscles around the ankle and to improve proprioception (described earlier under 'Other treatments') help to prevent ankle sprains. A physiotherapist can advise on these exercises. After having an ankle sprain, it is best to build up the muscles around the joint with exercises. A physiotherapist can show you which the best exercises to do are. This is because the stronger the surrounding muscles, the less likely a sprain will happen again (recur). Also, some exercises are designed to improve proprioception. This is the ability of your brain to sense movement and position of your body parts and joints such as the ankle. So, for example, good proprioception helps you to make immediate and unconscious minor adjustments to the way you walk when walking over uneven ground. This helps to prevent you overstretching ligaments and causing sprains.

Research review:

According to Colville, M. R., Marder, R. A., Boyle, J. J., & Zarins, B. (1990) [6], We measured strain in the lateral ligaments of 10 human cadaver ankles while moving the ankle joint and apply ing stress in a variety of ways. We studied the anterior talofibular, calcaneofibular, posterior talofibular, anterior tibiofibular, and posterior tibiofibular ligaments. Strain measurements in the ligaments were recorded continuously while the ankle was moved from dorsiflex ion into plantar flexion. We then repeated measurements while applying inversion, eversion, internal rotation, and external rotation forces. Strain in the anterior talofibular ligament increased when the ankle was moved into greater degrees of plantar flexion, internal rotation, and inversion. Strain in the calcaneofibular ligament increased as the talus was dorsiflexed and inverted. These findings support the concept that the anterior talofibular and calcaneofibular ligaments function together at all positions of ankle flexion to provide lateral ankle stability. We measured maximum strain in the posterior talofibular ligament when the ankle was dorsiflexed and externally rotated. The strain in the anterior and posterior tibiofibular liga ments increased when the ankle was dorsiflexed. Ex ternal rotation increased strain in the anterior tibiofibular ligament and decreased strain in the posterior tibiofib ular ligament. Based upon strain measurements in the lateral ankle ligaments in various ankle joint positions, we believe the anterior talofibular ligament is most likely to tear if the ankle is inverted in plantar flexion and internally rotated. Theoretically, the calcaneofibular ligament tears primarily in inversion if the ankle is dorsiflexed; the anterior tibiofibular ligament tears in dorsiflexion, especially if combined with external rotation; and the posterior tibiofibular ligament tears with extreme dor siflexion.

According to Renstrom, et al., (1988), Strain was measured in the normal anterior talofibular ligament (ATF) and the calcaneofibular ligament (CF) using Hall effect strain transducers in five cadaveric ankles. These measurements were made in

both ligaments with the ankle in neutral position and with the foot moving from 10° dorsiflexion to 40° plantarflexion in an apparatus that permits physiologic motion. The ankle ligaments were then tested with the foot placed in six different positions that combined supination, pronation, external rotation, and internal rotation. In the neutral position, through a range of motion of 10° dorsiflexion to 40° plantarflexion, the anterior talofibular ligament underwent an increasing strain of 3.3%. No significant strain increase was found with internal rotation. The only significant difference from the strains at the neutral position was in external rotation, which decreased strain 1.9%. In all positions, increased strain occurred with increased plantarflexion. The calcaneofibular ligament was essentially isometric in the neutral position throughout the flexion arc. The calcaneofibular ligament strain was significantly increased by supination and external rotation.

METHODOLOGY

Syndesmotic ankle sprains (high ankle sprains) are a challenging lower extremity injury for athletes and sports health clinicians. Epidemiologic data suggest that syndesmotic ankle sprains account for 11% to 17% of the ankle sprains in athletic populations. Most of these injuries occur in collision sports such as American football, wrestling, ice hockey, rugby, and lacrosse. Fifty to seventy-five percent of the ankle sprains in some collision sports are classified as syndesmotic ankle injuries. The overall incidence of tibiofibular syndesmosis sprains in the general public is unclear. However, considering the epidemiologic data available on syndesmosis sprains and the fact that about 10 million ankle sprains occur in the United States each year, there is no doubt that the number is large. Interest in this injury and its treatment has grown due to several recent syndesmotic ankle sprains in high-profile collegiate and professional athletes. Although it may appear that high ankle sprains are becoming more prevalent, this perception is more likely a product of increased awareness than a true increase in the number of these injuries. The primary purpose of this article is to discuss current concepts in the rehabilitation of syndesmotic ankle sprains. We begin with a brief overview of tibiofibular syndesmosis anatomy, mechanisms of injury, assessment, and factors in determining surgical versus nonsurgical intervention because this information provides a framework for the discussion of rehabilitation. Detailed reviews of these background topics are available for a more comprehensive discussion of distal tibiofemoral syndesmosis injuries.

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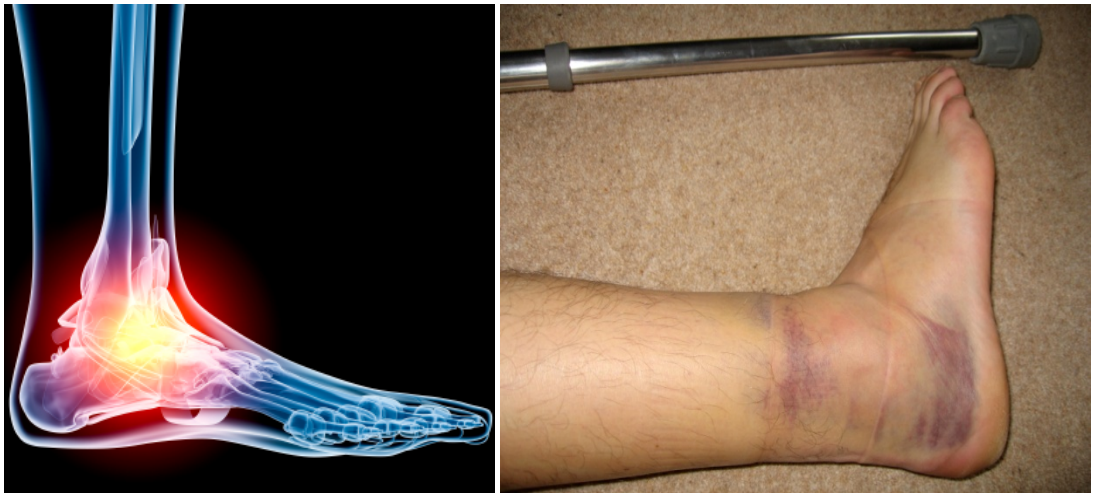

Figure 3: Ankle strain

Rehabilitation

We are unaware of any randomized clinical trials or case control studies that specifically investigate conservative management of syndesmotic ankle sprains. Current rehabilitation guidelines for syndesmosis ankle sprains are largely based on clinical experience; hence, our current approach (as discussed in this article) is largely based on clinical experience and a few case series (ie, Level 4 and 5 evidence). Most of the treatment principles employed are similar to those used in treating patients with lateral ankle sprains but with adaptations that take into account the unique anatomy, physiology, and pathomechanics associated with syndesmosis injuries. A recent survey of professionals who frequently treat high-level athletes with syndesmotic ankle sprains suggests that current management of high ankle sprains includes a range of rehabilitation approaches that extends from treating people with this injury exactly the same as those with lateral ankle sprains to treating all patients diagnosed with distal tibiofibular syndesmosis sprains with 4 to 6 weeks of nonweightbearing ambulation with the joint immobilized in a cast or boot. Each rehabilitation program for acute syndesmotic ankle sprains currently described in the peer-reviewed literature is either a 3- or 4-phase program with time- or criterion-based progression.

The external rotation stress test and the stabilization test can be used to assess healing and the patient's readiness for more advanced exercise, such as jogging and hopping. Careful monitoring and clear communication regarding the presence of pain, postexercise edema, or perception of instability are important in exercise prescription and determining readiness for progression. Patients are progressed to the advanced training phase when they are able to jog and perform a series of hops without pain.

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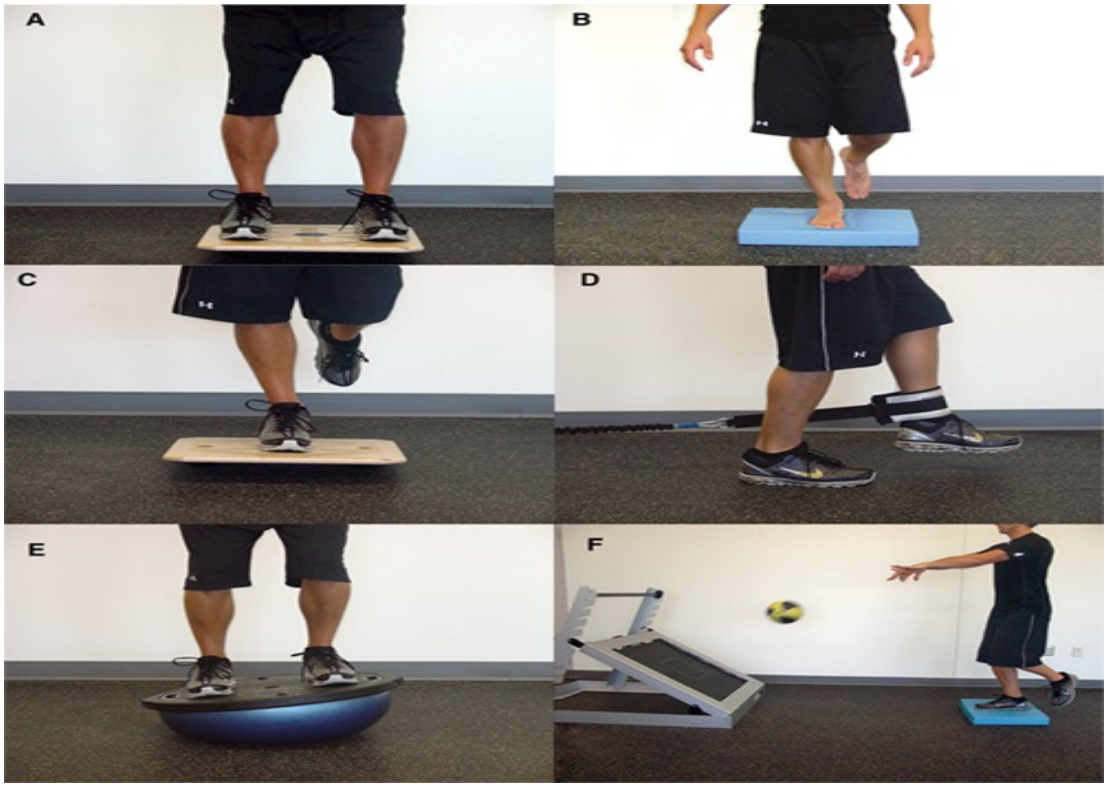

Figure 4: A sample progression of neuromuscular training exercises in the subacute phase of rehabilitation: A, double-leg balance on a balance board; B, single-leg balance on an air cushion; C, single-leg balance on a balance board; D, single-leg resistive cord exercises in which perturbation is applied via resisted movement of the opposite leg; E, double-leg weight shifts on a balance dome; F, throwing a weighted ball against a rebounder while balancing on one leg on an air cushion.

Advanced Training Phase

The goal of the advanced training phase is to prepare the patient for return to full activity in sports or activities of choice. More advanced neuromuscular training, agility drills, and sport-specific tasks are the central components of this phase. Exercises commonly used during this phase of rehabilitation include perturbation of support surfaces, jumping rope, hopping (forward, backward, and laterally), running, shuffling, and agility drills, such as carioca or running patterns. Exercises begin slow, with movement in a single direction, and progressively become more quick, intense, and dynamic. Athletic tape or a lace-up ankle brace is usually used to support the joint. Props such as cones, hurdles, ladders, and other devices can be used to advance the difficulty of the exercises. Power is trained through bounding, box jumping, and other plyometric training with athletes whose sports participation involves explosive movement. As the patient approaches return to sport, sport-specific drills such as dribbling a basketball or a soccer

ball, running football reception patterns, or sprinting with quick changes in direction are performed in a progressive fashion. Athletes are monitored for quality of movement and symptoms of pain or instability throughout this process. The patient is ready for return to sport when he or she can perform sport-specific tasks at game speed with good movement quality and little to no pain or instability.

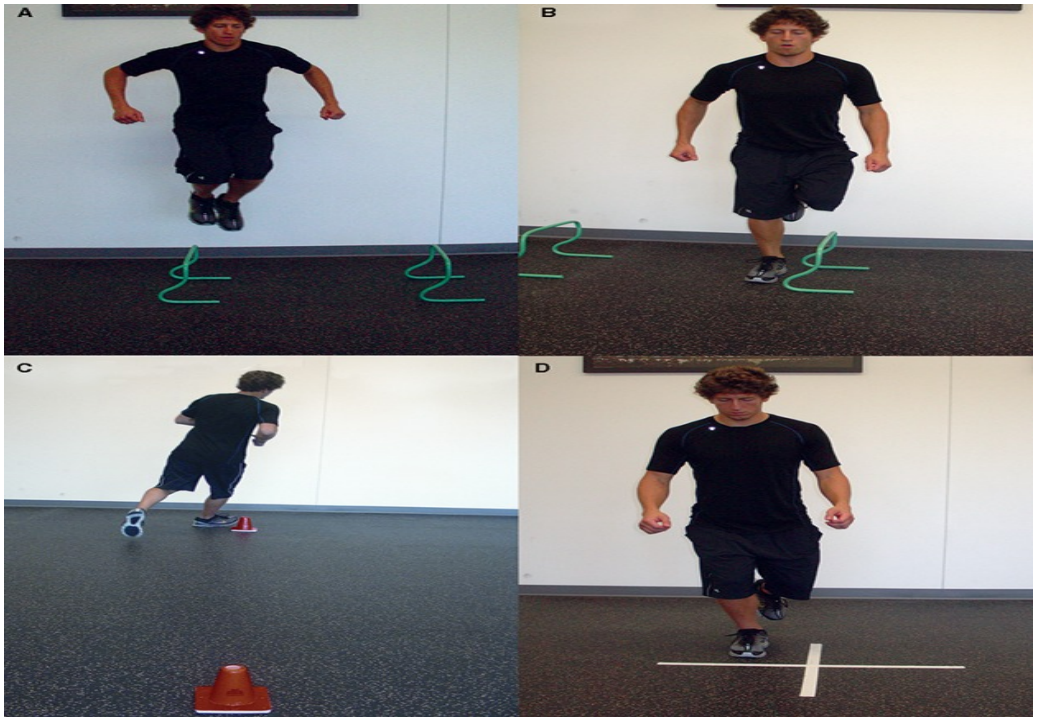

Figure 5: An example progression of functional/agility training exercises in the advanced training phase of rehabilitation: A, jumping over hurdles; B, hopping over hurdles; C, timed figure-8 running; and D, timed 4-square hop test.

Wobble board mobility

In the early stages of rehabilitation, a wobble board can be used to increase the range of motion at the ankle. Sit on a chair with the feet resting on a wobble board or rocker board. Move the feet forwards and backwards to mobilize the ankle. Avoid sideways or lateral movements early on or if it is painful as this will stress the injured lateral ankle ligaments. Later in the rehabilitation phase as pain allows sideways movements and movements in a circular motion can be performed.

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Figure 6: Wobble board mobility

Active inversion and eversion

This exercise will mobilize the ankle 'sideways' and so starts to stress the damaged ligaments. It should only be started when pain allows and healing is established. Simply turn the feet so the soles point outwards and then inwards. The movement should be gradual and within the limits of pain. Circling the ankle will also move the joint into these positions.

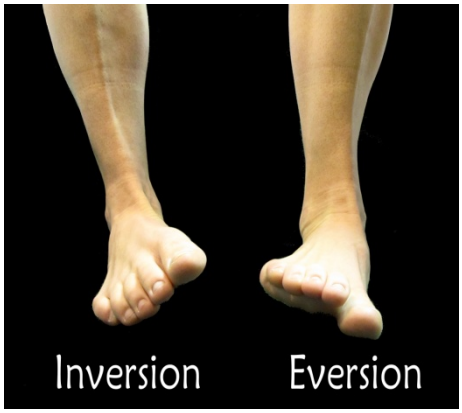

Figure 7: Active inversion and eversion

Soleus stretch

To stretch the soleus muscle the back leg should be bent. Place the leg to be stretched behind and lean against a wall keeping the heel down. A stretch should be felt lower down nearer the ankle at the back of the leg. If this stretch is not felt then a more advanced version is to place the forefoot of the front leg against the wall with the heel on the floor and push the from knee towards the wall.

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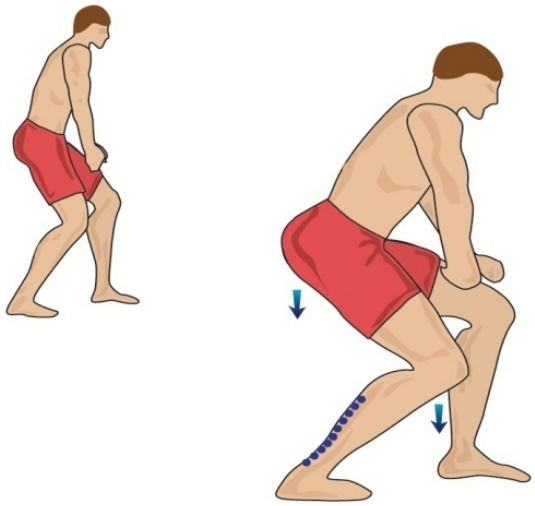

Figure 8: Soleus stretch

Resisted plantar flexion

Loop a resistance band around the forefoot and hold onto the ends. Point the foot away slowly allowing it to return to a resting position. Aim for 10-20 reps and 3 sets with a short rest in between. Once this exercise feels easy, you can increase the strength of the resistance band or progress on to full calf raise exercises. This exercise can be repeated with a bent knee to target the soleus muscle lower down the calf area.

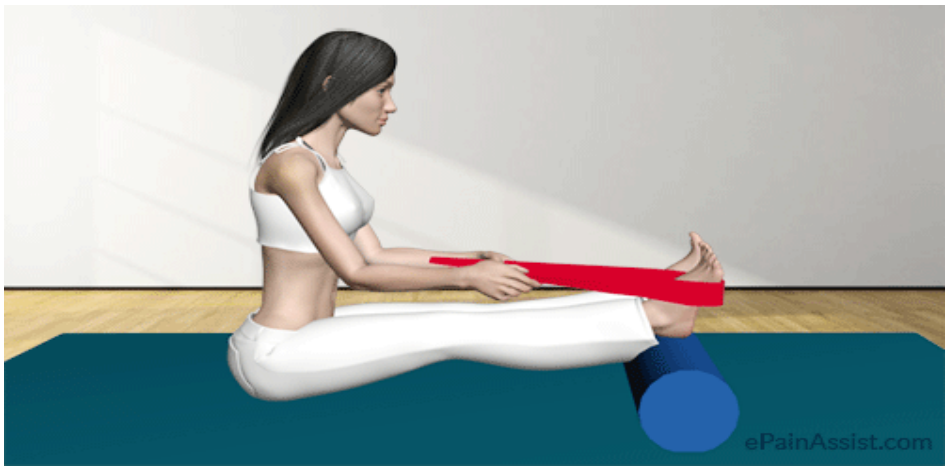

Figure 9: Resisted plantar flexion

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Calf raise

This exercise will strengthen the calf muscles which consist of the gastrocnemius and soleus muscles. Rise up and down on the toes in a smooth movement. You should be able to progress quite quickly with this one but aim for 3 sets of 10 and build up steadily, a few each day. Once you find this quite easy, start performing the exercise on one leg only. This will feel a lot harder, so start with low reps again and gradually increase. You can also perform these on a step as shown in the video, allowing the heel to drop down past the level of the step.

Figure 10: Calf raise

PARTICIPANTS:

The present study examined the effects of treatment using exercise extension techniques on the ankle strain pain in patients. Thirty patients with ankle strain in the foot were divided into two groups: an exercise rehabilitation group (n=15), and a control group (n=15). The exercise rehabilitation group received foot relaxation therapy and stabilizing exercises. Subjects in the control group received only the general physical therapies for the ankle pain. Subjects were measured for pain on a foot disability index. None of the results showed significant differences between the groups, while performing postures, internal rotation, and external rotation among the items showed significant differences between the groups. Exercise programs that applied can be said to be effective at improving the function of ankle strain rehabiliation patients.In the present study, 30 patients, who were diagnosed with exercise rehabilitation by an orthopedic surgeon, who had no neurological symptoms, and who showed negative results in tests (near collision signs, Hawkins collision signs, and pain arc signs), were selected as subjects from among the patients who were visiting the hospital. Using random sampling, the subjects were divided into an experimental group of 15 subjects and a control group of 15 subjects.

General characteristics of subjects (Mean±SD):

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	Experimental group (n=15)	Control group (n=15)
Age (yrs)	48.1±13.2	47.7±10.7
Height (cm)	165.2±10.0	161.9±6.0
Weight (kg)	60.1±12.5	54.8±8.6
Affected side (left / right)	3 / 13	5 / 11
Gender (male / female)	7 / 9	4 / 12
Headache (yes / no)	6 / 10	9 / 7

Table 1: General characteristics of subjects (Mean ± SD)

RESULTS:

The comparisons of the effects of the treatment on the two groups as measured by ankle strain are shown in Table 4.2. None of the results showed significant differences ($p>0.05$) between the groups, while performing postures, internal version, and external version among the items showed significant differences between the groups ($p<0.05$).

Table 2: Comparison of Ankle strain rehabiliation, pre-test and post-test in each group (Mean±SD)

	Experimental group (n=15)		Control group (n=15)	
	Pre-test	Post-test	Pre-test	Post-test
Exercises rehabilitation Group	35.64±9.51	39.35±8.46	33.48±9.69	36.88±8.58
Control group	26.81±5.67	21.56±5.41	26.94±4.51	22.75±4.52

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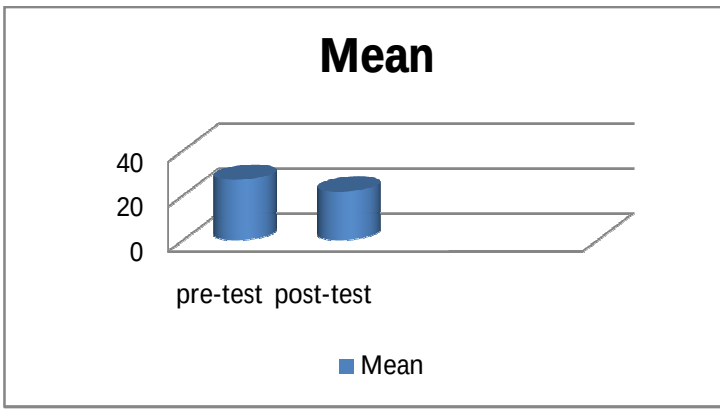
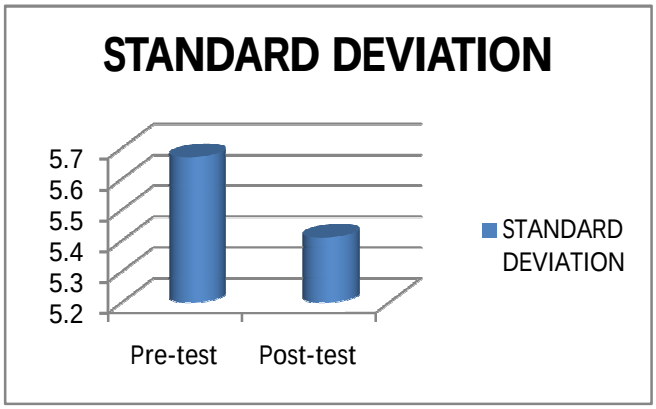
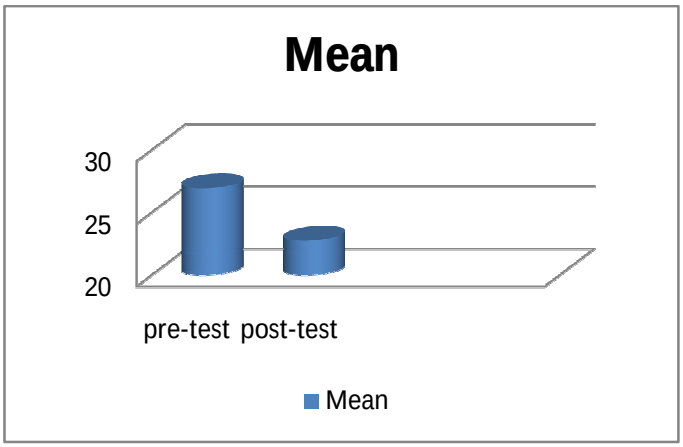
EXPERIMENTAL GROUP (N=15):

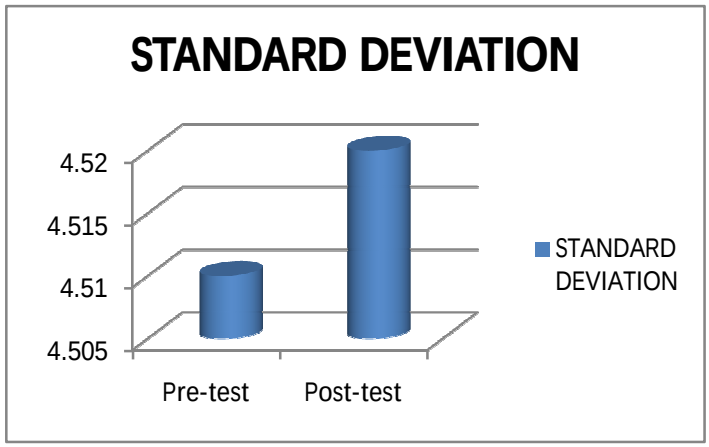




Graph 1: Mean in pre-test, post-testGraph 2: Standard deviation in pre-test, post-test

CONTROL GROUP (N=15)





Graph 3: Mean in pre-test, post-testGraph 4: Standard deviation in pre-test, post-test

Table3: Comparison of CMS between the pre-test and post-test in each group (Mean±SD)

		Experimental group (n=15)		Control group (n=15)	
		Pre-test	Post-test	Pre-test	Post-test
Pain		6.88±2.50	11.88±2.50	5.63±3.10	9.69±3.40
ADL	Work	2.44±0.51	2.88±0.50	2.31±0.70	2.69±0.48
	Recreation	2.38±0.50	2.81±0.54	2.26±0.74	2.71±0.73