Original Article

# Efficacy of Flexibility Exercise for Subjects with Achilles Tendinitis- Quasi-Experimental Study

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**Abstract**

**Background:** Achilles tendinitis is a habitual overuse injury, particularly in the field of sports which may involve lunging and jumping activities. This study focuses on how well brief flexibility exercises help subjects with Achilles Tendinitis and improves their functional activity and decreases the pain.

**Purpose:** The Purpose of the study is to determine the effect of flexibility exercise in reducing pain and in improving functional activity among subjects with Achilles tendinitis.

**Materials and Methods:** This is a Quasi-Experimental study where subjects with Achilles Tendinopathy were selected on the basis of the selection criteria. The subjects were briefed about the procedure and informed consent was acquired. Pre-test scores for pain and functional ability were recorded using NPRS and VISA, the same as post-test values after 4 weeks of intervention. The entire process was performed from November 2022 to March 2023.

**Result:** From the test values according to the VISA and NPRS it results that flexibility exercise for Achilles tendinitis helps in reducing pain and it gives the best result in improving functional activity.

**Conclusion:** According to the data gathered, flexibility training for four weeks with twelve sessions enhances physical activity and reduces discomfort in patients with Achilles tendinopathy.

**Keywords:** Achilles tendon, VISA, pain, functional activity

## Introduction

Achilles tendinitis (AT) is an illness marked by discomfort, pain, puffiness, and decreased action of the Achilles tendon. The tissue that joins the calf musculature posterior to the lower leg to the calcaneus. The tendon can become inflamed from overuse. Achilles tendonitis most frequently affects runners who have abruptly increased their run length or intensity. Middle-aged people who only participate in weekend sports like basketball or tennis are also prone to this. Most occurrences of Achilles tendinopathy can be managed with straight forward home sessions like treatment while under the guidance of the therapist. Personal-care techniques are a typical requirement for the cessation of recurring episodes. Achilles tendon ruptures can result from more severe occurrences of the condition and could

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need to be repaired surgically. Mostly, the prevalent causative factor of heel pain in the posterior aspect, and athletic population are at the highest risk, with an Achilles Tendinitis frequency of 11 percent to 18 percent. While runners are the most prone to acquire Achilles Tendinitis, it can also affect other athletes and those who are sedentary.[1] It is the degeneration or failure to heal as a result of repeated loading without adequate recovery. Tendinitis should not be used since it comprises inflammatory response, which may be present in the tendon that is wounded. There is diffuse increase in thickness, loss of collagen, an increase in proteoglycans, and seizing up of tissue order at the tissue level.[2] Overuse tendinopathy is a non-inflammatory condition characterized by a failing healing tendon reaction. Treatment for Achilles tendinopathy can be difficult as symptoms may continue despite conservative and surgical surgery.[3] Mechanical loading induced by eccentric strengthening can promote tendon repair. Although treatment programmes for Achilles tendinitis include flexibility exercise, eccentric exercise had improvement in pain, discomfort and outcome, the relieving rate and have shown that functional utility improvements are leisure, taking up to 4–5 yrs. The prevalence of Achilles tendinitis is up to 9% in runners and 30% in physically inactive individuals.[4] The non-operative treatment of chronic Achilles tendon insertion tendinopathy is understudied. The motive of the study was to establish the effectiveness of eccentric loading and flexibility to leg exclusively in subjects with insertional Achilles tendinitis, following the recent demonstration of their effectiveness in patients with Achilles tendinitis.[5] The Achilles tendon tear injury is the most prevalent sports-related injury among the adult population. Despite the rising prevalence, no consensus exists on the optimum treatment strategy, because both operational and nonoperative therapies have their own set of pros and disadvantages.[6] Running is a popular type of exercise, but it puts athletes at risk for a number of injuries specific to running. The majority of running injuries are caused by overuse and can be treated conservatively. The most prevalent form of treatment for tendinopathies in the hamstring, Achilles, and patellar tendons is flexibility exercise, stretching and eccentric exercise.[7] Achilles tendinitis is a usual wear and tear condition that causes significant discomfort and a decreased grade of daily living. The pathophysiology of Achilles tendinopathy is governed by several biomechanical and anatomical features, making selecting the best treatment strategy difficult.[8] The best way to treat an Achilles tendon rupture after surgery is yet uncertain. Over the last two decades, there has been a tendency toward less strict immobilization, quicker weight-bearing, and faster postoperative functional rehabilitation.[9] Tendinopathies cause severe morbidity, and there are currently just a few scientifically established therapeutic options. The tendons of the Achilles and Patellar are among the most fragile, and overuse lesions of the lower limbs are common. Achilles tendon pathologies can be treated conservatively with optimal results and functional outcomes, but surgery should be considered if this method fails.[10] Eccentric exercise may produce better results.[11] Achilles tendinopathies are common injuries that occur after sports activity, with men being more susceptible than women.[12] Blood flow restriction training has been demonstrated to be sound and effectual in building strength and stamina in healthy fit inhabitants, and it is currently being researched for application in post-injury intervention plan. BFR induces strength and hypertrophy gains at significantly lesser loads to the previous approaches, permitting subjects to commence rehabilitation considerably earlier.[13] Currently there is no agreement on the post-operative therapy for acute Achilles tendon rupture. There is debate over ROM and the quantity of weight- bearing or immobilisation required. Recent research has found that initial, functional resistance rehabilitation is beneficial in both conventional and surgical intervention.[14] The assessment methodologies and eccentric overload treatment procedure employed in this study can be advised to individuals with chronic Achilles tendon pain.[15] Tendinopathy, the medical term for discomfort in the Achilles tendon and the functional limits it causes, is widespread and places a heavy burden on society. For the general adult population, the prevalence figure of Achilles tendinitis is 2.35/1000 person-years.[16] Another possibility is that a significant effect may be the length of rear foot eversion. The length of eversion, however, hasn't gotten much attention in the biomechanics literature.[17] The two most popular stretching methods on the sports field are static and ballistic stretching. A relaxed muscle is slowly and carefully lengthened during static stretching. A rhythmic bouncing motion known as a ballistic stretch lengthens a muscle by utilising the swinging

body segment's momentum.[18] With the exception of eccentric training, which is the widely used regimen, no therapy is universally acknowledged for treating the common musculoskeletal condition Achilles tendinitis.[19] According to anatomical location, there are two basic types of Achilles tendinitis.[20]

## Aim

The aim of the study is to determine the effect of flexibility exercise with subjects with Achilles tendinitis.

## Material and Method

This is a Quasi-Experimental study where 30 subjects with Achilles Tendinitis were selected on the basis of the selection criteria from a private hospital from Chennai. Pre-test scores for pain and functional ability were recorded using NPRS and VISA, the same as post-test values after 4 weeks of intervention.

**Study period:** from November 2022 to March 2023.

**Inclusion Criteria**

- Both male and females
- 18-70 years of age
- Thompson test positive (The patient lies prone with his foot over the end of the table. Alternatively, the patient could lie prone with his knee flexed to 90°. The examiner squeezes the calf muscles, specifically the gastrocnemius - soleus complex, with his hand Squeezing the calf should cause contraction of the Achilles tendon, resulting in plantar flexion. If the Achilles tendon is completely ruptured, there will not be any apparent plantar flexion.).
- Pain present for ≥4 weeks
- Positive Achilles palpation test
- Decreased plantar flexion endurance test vs contralateral leg
- Isometric heel raise test

**Exclusion Criteria**

- Vascular or sensory disturbances in lower leg
- Inflammatory conditions of the lower limb
- Subjects with Lymphedema
- Subjects with peripheral vascular or arterial disease
- Subjects with DVT.

**Outcome Measures**

Assessment was done at initial and at the end of the study using

**VISA:** The Victorian Institute for Sport Assessment is seen as a valid and reliable self-reported scale for disorders related to Achilles Tendinitis (VISA). It is used to investigate the functional severity of chronic Achilles tendinitis in patients. It's a simple self-reported survey that assesses clinical features and their impact on physical activeness. VISA comprises 8 questions that covered 3 domains of pain (questions 1-3), function (questions 4-6), and activity (questions 7) and Questions 1 to 7 are scored out of 10, and question 8 carries a maximum of 30. Scores are totalled to give a total out of 10 with lower scores indicating greater disability [(21)]. **NPRS:** Numerical pain rating scale is used as the primary source of outcome for this study design. The Scale described the severity of pain by encircling on a horizontal segmented line from 0 (no pain) to 10 (worst pain).

**Procedure**

The study was conducted as a Quasi experimental study at SIMATS. The sample was collected at PHYSIO360 CLINIC. The assessment was accepted by the Institutional Board of Review of Saveetha College Physiotherapy. A total of 30 subjects were randomly selected based on selection criteria and informed consent was obtained after explaining the safety and simplicity of the study. The subjects of age between 18-70 yrs of both genders with pain > 4 and with positive Achilles palpation test and decreased plantar flexion endurance test were included in the study and subjects with vascular or sensory disturbances in lower limb, inflammatory conditions, any bleeding or clotting conditions, peripheral vascular or arterial disease, pregnant or may be pregnant were excluded from the study. Pre-test values for functional ability and pain were recorded by VISA questionnaire and NPRS respectively. The subjects were trained with flexibility exercise that involves exercise programs including concentric and eccentric exercises regimen to the triceps surae, tibialis posterior, hip and foot intrinsic were also given. The treatment was given

on alternate days for 4 weeks, a total of 12 sessions. Following the training session, the post-test values were recorded using the same outcome measure and the significant difference was noted.

**Study Period:** from November 2022 to March 2023.

**Treatment Protocol**

No of Sets: 3

No of Repetitions: 10

Rest period: 10 seconds

Sessions: 3 sessions per week for 4 weeks.

**Flexibility Exercises**

1. Zig-Zag Hops:

Jump on one foot in an alternating diagonal (zig zag) pattern across each side of a line. Subject is asked to Jump and land on the forefoot while keeping the other foot elevated. Aim for minimal ground contact time and minimal knee flexion.

**1. Double Leg Hop**

Subjects are asked to stand with feet kept together and keep arms straight out in front of the subject. Then they were asked to jump upwards and forward as far as they could. As soon as they land, jump again. Repeat the motion for the desired number of repetitions.

**2. Dynamic Step Ups**

Place a step-up stool. Stand facing the platform with the feet hip-width apart. Step up with an alternate leg. Repeat the motion for the desired number of repetitions.

**3. Achilles Hops**

Take a stool, place one leg on it and hold a weight of 2kgs using an ipsilateral hand. Place the injured leg one step backwards so that the Achilles tendon stretches and then the subject is asked to hop continuously for one minute.

**4. Calf Raise**

To do a calf raises subjects are used to stand with your feet about shoulder-width apart. And then they were asked to let arms hang straight below the shoulders. Rise up onto the toes, and then slowly return to the starting position.

**5. Floating Heel Weight Pass**

Take a stool, place one leg on it and hold a weight of 2 kgs using your hand. Place the injured leg one step backwards so that the Achilles tendon stretches and then the subject is asked to transfer the weight from one hand to another hand.

**6. Heel Drops**

Stand with the feet about 10cms apart with hands lightly resting on a counter or chair in front of the subject. Slowly raise heels off the floor while keeping knees straight.

**Data Analysis**

The collected data was tabulated and analyzed using descriptive and inferential statistics. To all parameters mean and standard deviation (SD) was used. Paired t-test was used to analyze significant changes within the groups and Unpaired t-test for between group analysis. Man Whitney test was used for nonparametric analysis.

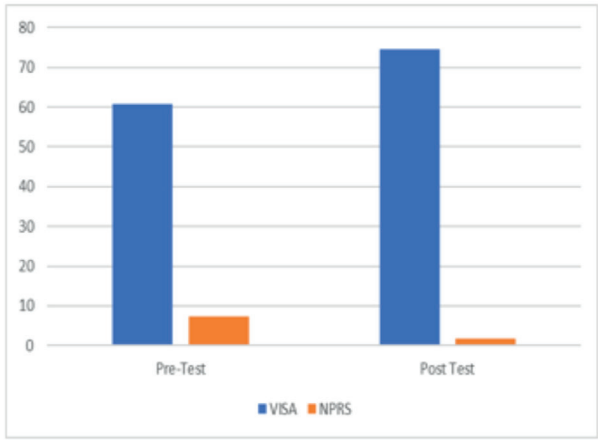


**Fig-1: Pre and Post Test mean values for VISA and NPRS**

## Result

All 30 subjects completed the study successfully pre-test and post-test values of NPRS and VISA were presented in the Fig 1. From the quantitative examination evaluated using the statistical data, it was noted that an exceptional contrast among the pre-test values and post-test values were observed. Hence from the test values according to the VISA

and NPRS it results that Manual therapy for Achilles Tendinopathy helps in reducing pain and it gives the best result in improving functional activity.

## Discussion

This study mainly focused on improvement of pain and functional ability by flexibility exercise for the patient with Achilles tendinopathy. Interestingly, we found a significant increase in the mean by obtaining the difference in the pre and post-test values. Therefore, after giving exercises there is a lot of improvement in the patient. McCormack JR et al first reported eccentric exercise and flexibility exercise was seen to be more advantageous and beneficial to eccentric exercise.[1] Rompe JD et al applied eccentric stack exercise and showed very less positive outcome to low-energy exercise in subjects with long term tendon pathology of the insertion of the Achilles Tendon at a 4-month follow-up.[6] Vescio A et al from his study said that a lot of conventional modes of management have been found, but no treatment was welcomed, other than eccentric training, which is commonly used.[19] Valkering KP said that mass-bearing after Achilles rupture encourages the healing process. Cause-and-effect relationships cannot be established because of poor control group and the non-experimental study design, and other factors like thrust and non-joint thrust mobilisation might be in charge of the patient's improvement. Each patient's pain and function did, however, improve right away after joint treatment, indicating that they at least experienced fast alleviation.[14] Patients also reported satisfactory results at relieving at 12 weeks and follow up. Comparisons of manual therapies are less trustworthy since thrust adjustment may have a different therapeutic effect than eight minutes of high-grade mobility. Manual treatment is still a patient-specific approach that necessitates expert clinical judgement, though. Three patients' therapy included eccentric exercise in addition to joint manipulation and mobilisation. Tenderness and discomfort levels, PPT measurements, and raising single leg heel ability were immediately improved after mobilisation and adjustments. Developments were consistently observed and noted over the duration of treatment, and also during the nine-month follow-up. The data suggest that additional study into the function of flexibility exercise regimen in the intervention plan of Achilles tendinitis is required. Muh Khaidir in his study concluded that there was a difference between body flexibility level in pre and post-test after giving concentric exercise. Edman G in a study concluded that Functional load-bearing mobilization improved healing results of Achilles tendon rupture. Also, initial ankle ROM was enhanced without Achilles tendon elongation and without changing long-term outcome.[14] Henning langberg concluded that a VISA score lesser than 24 is rarely obtained in Achilles tendinitis. Only few subjects with AT acquire an equivalent VISA score when seen to uninjured healthy individuals post treatment. The VISA is a valid tool when assessing AT patients.[21]

## Conclusion

The motive of the study is to evaluate and assess the effects of flexibility exercises in subjects with Achilles tendinitis. According to the data gathered, flexibility training for four weeks enhances physical activity and reduces discomfort in patients with Achilles tendinopathy. Therefore, flexibility exercises are suggested to lessen pain, discomfort, and increase functional motility, which will improve their welfare, academic performance, and ADL. ISRB approval: This research work has been approved by the ISRB committee.

**Ethical clearance:** The ISRB committee of a private hospital and institution in Chennai has provided its clearance for the conduct of human research that complies with all applicable national laws, institutional regulations. (Application Number 03/068/2022/ISRB/SR/SCPT).

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**Conflict of Interest:** Nil.

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