Current Physical Therapy Management and Clinical Evaluation for Achilles Tendinopathy

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ABSTRACT

Achilles tendinopathy (AT) is common in both the general population and athletes, especially in running and jumping sports. The incidence of AT is 43% in athletes, but as high as 83% in middle-distance runners. However, 30% of patients have a sedentary lifestyle. Currently, the physical therapy (PT) is an effective conservative treatment and more widely population. Objective this review article is update the most effective physiotherapy treatment and the most validity and reliability clinical evaluation for AT. Destination is to provide physical therapist guideline for select appropriate clinical practice. The results of the literature review found that key treatment recommendation for AT is to follow an eccentric exercise protocol, which is the most common intervention for the management of functional limitations in AT. Extracorporeal shockwave therapy (ESWT) is the most commonly used next step when patients do not respond to eccentric exercise. Also, eccentric exercise combined with ESWT and eccentric exercise combined with ankle joint mobilization can improve immediately enhance their quality of life more than either treatment alone. Clinical evaluation can utilize many tools but the VISA-A questionnaire was developed as a validity and reliability assessment for AT. A limitation of the VISA-A questionnaire is that it was designed for athletes only, and so is inappropriate for the general population.[3,4,8,13,16] The FAOS questionnaire has been accepted as a valid and reliable tool for evaluating foot and ankle injuries.[1,14] Clinical evaluation is recommended to choose the appropriate assessment tool each patient (for the general population or athletes).

Keywords: Achilles tendinopathy; physical therapy; conservative treatment; eccentric exercise; clinical evaluation (Siriraj Med J 2023; 75: 399-406)

INTRODUCTION

Achilles tendinopathy (AT) is common in both the general population and athletes, especially in running and jumping sports.[1,2,4] The incidence of AT was reported to be 43% in athletes, and as high as 83% in middle-distance runners.[4] However, 30% of patients have a sedentary lifestyle. The etiology of AT may be related to intrinsic factors or extrinsic factors or a combination of both. Intrinsic factors comprise biomechanical abnormalities of a lower extremity, underlying disease, such as obesity or gout, and patient characteristics, such as age.[2,5,10] Extrinsic factors comprise training errors and immoderate mechanical overload.[2,5,10] AT is classified into insertion or midportion tendinopathy based on the location of the pain. Midportion tendinopathy is most commonly characterized by pain 2 to 7 cm proximal to the calcaneus attachment. Insertion tendinopathy is pain at the posterior calcaneus.[4,5,8,9] AT tends to involve a gradual onset of pain, swelling, morning stiffness, a range of motion limitation, and impaired function. Finally, AT can obstruct patients from performing sports and decrease their quality of life.[1,3,4] Treatment for AT can be divided into conservative and surgical treatments. Conservative treatment can involve various methods,

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such as acupuncture[5], medicine[1], injection[3], orthosis[4], and physical therapy.[2] Surgical treatment is suggested if conservative treatment fails, or for tendons requiring debriding, augmentation, or reconstruction.[1,3,5,10] Currently, the physical therapy (PT) is an effective conservative treatment and more widely population.

PT can involve various treatments, such as exercise, mobilization treatments, and modalities (shock waves, ultrasound, laser, e.g.,).[5] and clinical evaluation can utilize many tools.

Focused clinical question

Currently, what is the most effective physiotherapy treatment (exercise, manual therapy or modality) for AT? What is the most validity and reliability clinical evaluation for AT?

Conservative treatments:

1. Exercise

There is strong evidence of the effectiveness of exercise rehabilitation as a primary treatment option of AT.[3,4] Indeed, there are several exercise protocols in AT, including the Silbernagel protocol, heavy–slow resistance protocol, Stanish protocol, and eccentric exercise protocol.[2,3] The eccentric exercise protocol is the most common intervention in the management of pain and functional limitations in AT,[6,7,9,10,12] and the rates of a successful outcome after treatment have been reported to range from 56% to 89% for midportion AT and 28%–32% for insertion AT.[9] The purpose of eccentric exercise is to decrease pain, improve the healing process, improve calf muscle strengthening, lengthen the myotendinous junction, and improve the tendon structure in AT.[4,8,10,12] In particular, patients can benefit from performing exercises with the knee extended or the knee slightly flexed[9,13] as both positions activate the calf muscle, while having the knee slightly flexed activates the soleus muscle.[13] Patients are usually instructed to perform eccentric exercises in 3 sets of 15 repetitions per session and 2 sessions per day in both positions.[1,2,9,11-13] In the first eccentric exercise, the patients stand with their weight on the affected side of the foot with a neutral ankle position with the knee extended as the starting position (Fig 1A) and then they move their heel up to the end range of ankle plantarflexion (Fig 1B), and then slowly lower their heel down to the end range of ankle dorsiflexion in a count of 5 (Fig 1C). The sound side of the foot assists the patient to return to the starting position.[1,11-13] In the second eccentric exercise, the patients stand with their weight on the affected side of the foot with a neutral ankle position with the knee slightly flexed as the starting position (Fig 2A) and then they move the heel up to the end range of ankle plantarflexion (Fig 2B), and then slowly lower the heel down to the end range of ankle dorsiflexion in a count of 5 (Fig 2C). The sound side of the foot assists the patient to return to the starting position.[1,11-13] In the event that the patients are unable to complete the protocol of 3 sets of 15 repetitions, the patients are instructed to begin with a lower number of sets or/and repetitions, such as 2 sets of 10 repetitions, and then to increase the number up to the full protocol when the patients are ready to complete the full exercise program.[9,11] In the first phase, the patient's bodyweight acts as the resistance for the exercise. When the patients are able to stand on the affected side with no pain or discomfort, they can progress by increasing the resistance

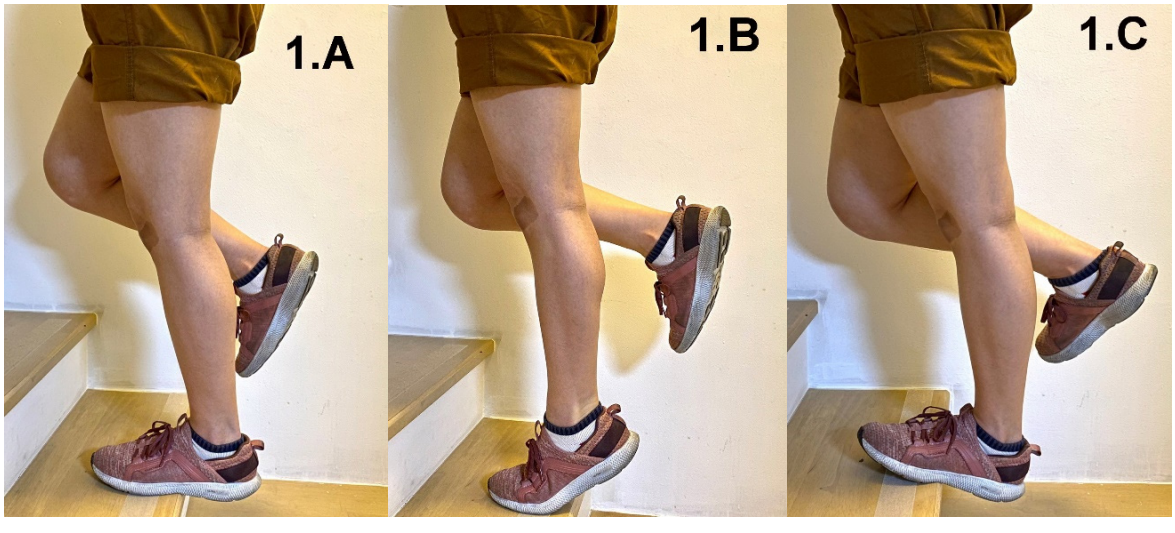

Fig 1. Eccentric exercise with the knee extended. In the starting position, the knee is extended with the ankle in a neutral position (1A). Controlled movement of the ankle into end range plantarflexion (1B). Controlled movement of the ankle into slow end range dorsiflexion (1C).

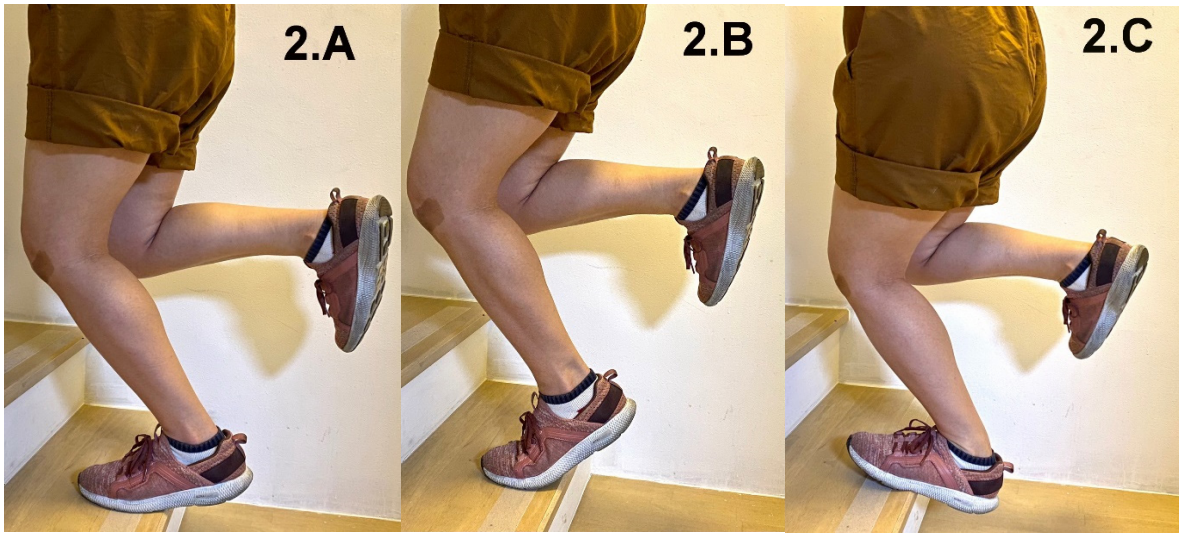

Fig 2. Eccentric exercise with the knee slightly flexed. In the starting position, the knee is slightly flexed with the ankle in a neutral position (2A). Controlling the ankle in end range plantarflexion (2B). Controlling the ankle in slow end range dorsiflexion (2C).

in the exercises.[1,12,13] Patients are able to increase the load by wearing a backpack weighing 5 kg. Later, they can increase the weight when the pain during and in finishing the exercises is minimal.[1,11,13] Patients may experience some muscle soreness for a couple of weeks after completing the exercises.[13] However, if patients have increased pain that makes them unable to complete the eccentric exercise program, they should discontinue the program and be referred to a doctor.[13]

2. Manual therapy

2.1 Mobilization therapy

Manual therapy has been shown to be a safe and effective intervention for the treatment of AT.[8] AT can involve limited ankle dorsiflexion mobility, hypomobility in the subtalar joint, and weakness of the ankle plantar flexor group muscle.[8,15] Ankle joint mobilization therapy appears to be a suitable treatment in AT because it can improve ankle mobility, decease pain, and improve plantar flexor group muscle endurance for the purpose of decreasing overloading of the Achilles tendon when walking or running.[8,15] Biomechanically, limited ankle dorsiflexion during walking or running has been related to subtalar joint overpronation, and overpronation of the subtalar joint has been reported to be associated with the development of AT. Improvement in ankle dorsiflexion has been reported to be associated with a normal gait pattern in weight-bearing lower extremities, and decreased compensatory subtalar joint pronation, causing a decrease in abnormal loading of the Achilles tendon.[15] Movements involving hip rotation during walking or running are related to the position of the ankle in terms of supination and pronation. Impaired movement in hip extension has been reported to be related to the development of AT. Examination, treatment, and evaluation are recommended for hip movement issues in AT. Hip mobilization for extension therapy can improve the normal foot position for more effective push-off during walking or running.[15] Joint mobilization therapy can provide a hypoalgesia effect to decrease pain and weakness. Evaluation is usually made based on a pain scale and the performance of the patient in doing heel raise repetitions.[15] Talocrural joint therapy is performed to address secondary limitations in ankle dorsiflexion. Talocrural joint mobilization therapy aims to improve talocrural joint mobility by promoting the plantar flexor mechanism and functional force generation through decreasing pain by anterior–posterior gliding of the talocrural joint (grade III–IV glides), for about 4 min or for more joint mobility[8,15] (Fig 3). Similarly, subtalar joint lateral gliding mobilization therapy aims to improve subtalar joint mobility by promoting the plantar flexor mechanism and functional force generation through decreasing pain by lateral gliding of the subtalar joint (grade III–IV glides), for about 4 min or for more joint mobility[8,15] (Fig 4). Self-mobilization exercises for subtalar joint lateral gliding mobilization can be an added component of a home program taking up 5 minutes once a day[15] (Fig 5). Hip joint extension mobilization therapy aims to improve hip mobility for promoting a normal pattern of walking and running by performing posterior–anterior gliding of the hip joint (grade III–IV glides), for about 4 min or for more joint mobility[8,15] (Fig 6).

Fig 3. Talocrural joint long-axis thrust mobilization. With the patient in a supine lying position, the PT practitioner grasps the plantar aspect of the involved foot with his thumbs, while grasping the talus with the ring finger. Talocrural joint distraction is added, with concurrent ankle dorsiflexion. Ankle inversion or eversion is added, as required, to increase tissue resistance. A long-axis thrust is performed.[8]

Fig 4. Subtalar joint lateral gliding mobilization. With the patient in a side lying position on their effected side, the PT practitioner stabilizes the distal tibia and fibula with one hand, while with the other hand, the PT practitioner grasps the calcaneus, distal to the talus, and provides a mobilization force vertical to the ground.[8,15]

Fig 5. Self-mobilization of the subtalar joint lateral gliding mobilization. With the patient crossing the effected leg side over the opposite thigh, the stabilization hand grasps the distal fibula and lateral aspect of the talus, while the mobilization hand grasps the calcaneus and directs a lateral force vertical to the ground.[15]

Fig 6. Hip joint extension mobilization. With the patient lying in a prone position, the PT practitioner mobilizes a posterior–anterior force directed to the hip joint, while concurrently taking the distal femur superiorly into extension.[15]

2.2 Deep friction massage

Deep friction massage is widely used to treat AT.[16,20] Deep friction massage is an effective treatment in AT as it can promote the healing process, activate the regeneration of damaged tissue, facilitate the normal alignment of soft tissue fiber, decrease muscle tightness, improve the range of motion in the ankle joint, improve function, relieve pain, reduce abnormal part injury adhesive fibrous tissue, and increase scar tissue movement in subacute and chronic injuries.[10,16,19] Some research has indicated that issues with the range of motion in the ankle joint could increase the risk of overuse symptoms in the musculotendinous junction of the calf muscle. For instance, calf muscle tightness is related to a decreased range of motion, but the range of motion in the ankle joint could be increased after the release of certain trigger points in the gastrocnemius and soleus muscle. Trigger points at the soleus muscle can cause pain that can indicate AT. Deep friction massage can release the gastrocnemius and soleus muscle through thumb pressure massage applied to the painful and tense calf muscle area until the pain has started to decrease or the muscle has started to relax, but not for more than 60 seconds per point. Pressure applied on the muscle should help control the patient's pain to be more tolerable. However, if the patient's pain means that they cannot fully tolerate the pressure, the PT practitioner should remove the applied pressure and apply this at another point and start to apply the minimal pressure there. The PT practitioner should use palpation by the thumb to search for a tender point, trigger point, and taut band on the medial and lateral side of the soleus muscle and gastrocnemius muscle. In most common cases, the patients should sense a

decrease in pain at the calf muscle and Achilles tendon immediately after the deep friction massage. If this is not the case, the treatment should be repeated with a little increased pressure, and if the patient still cannot sense that, it is recommended to consider another treatment. Despite this, it is suggested that deep friction massage to the calf muscle is a useful future treatment for AT, because trigger points may be related to pain in AT.[16,22]

3. Novel Physical modality - Extracorporeal shock wave therapy

Extracorporeal shock wave therapy (ESWT) is conservative treatment in AT.[2,14] ESWT is most commonly used as a next step if patients have not responded to other conservative treatments, such as eccentric exercise, ultrasound, cold pack, laser, or injections.[6] ESWT comprises two types when applied in AT: focused-ESWT (F-ESWT) and radial-ESWT (R-ESWT).[5,14] F-ESWT is used in deep or small area tissue focus point.[5,14] R-ESWT is used in superficial or large area tissues.[5,14] Currently, there is no evidence-based consensus on whether F-ESWT or R-ESWT is better for AT.[2] The mechanism stimulation process of ESWT starts with Achilles tendon regeneration in AT by promoting the proinflammation process and catabolic process, which are associated with removing damaged matrix components.[10] ESWT can decrease pain, promote the healing process, improve the function, and increase the patient's quality of life and satisfaction with treatment.[4,14] The effective application of ESWT can comprise different doses and durations. R-ESWT uses a number of pulses per session, typically from 2,000 to 3,000, a frequency of 15 Hz, with energy increasing from 1.4 to 3.0 bar, for 3 to 5 sessions, but once a week.[5] F-ESWT uses 1500 pulses per session, a frequency of 2.3 Hz, with the energy increasing from 0.12 to 0.4 mJ/mm^2, for 3 to 5 sessions, but once a week.[5] There is recent evidence supporting combining ESWT and eccentric exercise for AT showing that combined treatments are more effective than lone treatments.[2,4-6,14] After treatment, some skin reddening and a little to intermediate discomfort may be found, but no bruising.[5]

4. Conventional physical modality

4.1 Cryotherapy

Cryotherapy is a general management approach for musculoskeletal injury. The physiological effects of AT on the Achilles tendon include a reduction in the metabolic rates of cells, reduction in the expanded capillary blood flow, decreased conduction velocity of the nerve, and reduced muscle spindle activity.[10,19] The compression in cryotherapy can be effective by increasing oxygen saturation in AT.[18] The physiological response to this treatment is conducive to decreasing cell hypoxia injury, relieving pain, and relieving muscle spasms.[10,18,19,21] Recently, evidence is less supporting its practice in AT.

4.2 Low level laser therapy

Low level laser therapy can stimulate tenocyte proliferation, increase the collagen bundle, increase the number of small blood vessels, and decrease the capillary flow neovascular. Finally, low level laser therapy can conserve the elasticity of the Achilles tendon. In the future, new quality research is expected to prove and support the further application of low-level laser therapy in AT.[10,17] Recently, low level laser therapy has drawn conflicting evidence for its support, but some research has reported low level laser therapy combined with exercise to have beneficial effects for the treatment of AT.[4]

4.3 Ultrasound

Ultrasound is a common modality of physical therapy. Ultrasound techniques can be divided into the pulse mode and continuous mode. The pulse mode can improve the healing process by non-thermal effects, while the continuous mode increases the blood circulation and causes muscle relaxation by thermal effects. Therapeutic ultrasound can decrease swelling, relieve pain, and increase the function in AT. However, the evidence base for the use of ultrasound for AT is insufficient to support its practical use in clinic.[10]

4.4. Superficial heat therapy

Superficial heat therapy has been traditionally used in chronic cases for AT management for decreasing pain and improving joint mobility. Thermotherapy can help relieve muscle spasms, improve local blood flow, and assist the inflammation process of infiltrates, swelling, and chemical exudation. Some evidence supports its use for vasodilation, to increase blood flow, and for the warming of superficial tissue and to improve cell metabolism.[19]

5. Prevention

AT prevention measures in impact sport participation include Achilles stretching and plantar flexors group muscle strengthening. Posterior kinetic chain strengthening exercises include erector spinae muscle strengthening exercise, gluteus group muscle strengthening exercise, hamstring group muscle strengthening exercise, gastrocnemius muscle strengthening exercise, and soleus muscle strengthening exercise, and have been found to

be beneficial for preventing AT. High-impact loading athletes should optimize their tibiotalar joint and subtalar joint mobility. Balance training has been suggested in athletes as a successful prevention tactic.[2] In sport participation, athletes should be careful not to overload joints at the early stage. Athletes and PT practitioners should be aware of the signs and symptoms of AT in the early stage. Monitoring the training load would be advantageous for detecting changes in training load as a way to decrease the risk factors of AT. Changes in the tendon structure, such as a tendon tear or tendinopathy, are risk factors for developing AT. The clinician could use ultrasound imaging for information to grade training and performance measures to assess whether an athlete can take part in heavy practice. The optimal prevention is to recognize the early symptoms and adjust the training loads as required, as the earlier the injury detection, the shorter the period for recovery.[4]

Clinical evaluation:

1. Visual analog scale (VAS)

The visual analog scale (VAS) is the most commonly used patient measure for pain (on a scale of 0–10, where 0 indicates no pain and 10 indicates the worst pain imaginable). The VAS has been used to indicate pain at rest, pain during palpation, and pain on movement. VAS has also been associated with estimating clinical improvement.[1,4,5,23]

2. Observation

Clinical evaluation can include observing the static and dynamic alignment of the foot and ankle. AT has been related to either percavus or perplanus combined hyperpronation.[2] Midportion AT can specifically present with a localized thickening (fusion pattern).[2]

3. Range of motion

The range of motion can be measured as non-weight bearing by a goniometer and weight bearing by the ankle lunge test. The ankle lung test entails the patient adopting a standing position with the knee joint straight and then performing slight flexion of the knee joint. The recommendation is to evaluate the ankle dorsiflexion range of motion, because a limited dorsiflexion range of motion may be characteristic of AT.[2,4,16] In assessing hip joint mobility for a case with a decreased hip extension, an assessor movement test involving a posterior–anterior glide showed hypomobility of the hip joint.[15] The movement was assessed at the talocrural joint and subtalar joint, because these may often be found to be restricted in the assessed movement.[15]

4. Palpation

Palpations may be found at tender points or a thickness at the Achilles tendon and a taut band at the gastrosoleus muscle.[15] Palpations may act as guidance for detecting myofascial pain of the gastrocnemius muscle and soleus muscle.[24] Sometimes, myofascial pain syndrome may be combined with AT or may be separate, so the palpation may be distinguished in the referred zone pain as myofascial pain syndrome or AT.

5. Muscle power

Calf muscle strength is affected by AT, because the reduction in plantar flexor muscle strength is an important risked factor for AT. A dynamometer can be used to measure the ankle plantar flexor muscle and dorsi flexor muscle strength, both for concentric and eccentric contraction.[4]

6. Functional evaluation

Functional evaluation can be performed using the heel rise test. The heel rise test assesses endurance for the calf muscle. The starting position requires the patient to stand with their knee straight. The PT practitioner allows the patient to place 2 fingertips per hand on the wall to maintain balance. The PT practitioner instructs the patient to raise each heel as high as they are able until they feel fatigued. A metronome is used with an approve consistent rhythm with the frequency of heel rise performed at 30 per min based on literature measures for using this endurance test. The amount of repetitions, maximum height of heel rise, and total number of patients able to perform the test are used to calculate and compare the degree of functional impairment between the normal side and abnormal side.[4,23,24]

7. Questionnaire

The Victorian Institute of Sport Assessment-Achilles (VISA-A) questionnaire was developed as a validity and reliability assessment for AT. The VISA-A questionnaire is easy to use to self-report pain and functional disability. It comprises 8 questions related to pain, function, and sporting activities. The scores range between 0 to 100, with 100 indicating good physical activity. A higher VISA-A score indicates decreased pain and improved function. A limitation of the VISA-A questionnaire is that it was designed for athletes only, and so may be inappropriate for the general population.[3,4,8,13,16] The Foot and Ankle Outcome Score (FAOS) questionnaire has been accepted as valid and reliable for the evaluation of foot and ankle injuries. The FAOS questionnaire was responsive when assessed in AT. It defines five subscales of pain, activities

of daily living, sport and diversion functions, foot and ankle related quality of life, and other symptoms. Scores range from 0–100, with 100 illustrating no symptoms.[1,14]

CONCLUSION

Exercise is accepted to have the highest level of evidence, encouraging its use as a key management strategy for AT.[6] In case exercise is not successful in treatment, ESWT is considered as the next step treatment option.[6] Further, eccentric exercise combined with ESWT and eccentric exercise combined with ankle joint mobilization can improve immediately enhance patients quality of life more than either treatment alone for AT.[8,14] Prospective recommendation follow the treatment for AT with high laser pawer therapy and peripheral magnetic stimulation are new intervention and have not currently been studied. Clinical evaluation can utilize many tools but the VISA-A questionnaire was developed as a validity and reliability assessment for AT. A limitation of the VISA-A questionnaire is that it was designed for athletes only, and so is inappropriate for the general population.[3,4,8,13,16] The FAOS questionnaire has been accepted as a valid and reliable tool for evaluating foot and ankle injuries.[1,14] Clinical evaluation is recommended to choose the appropriate assessment tool each patient (for the general population or athletes).

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