RUTH L. CHIMENTI, PT, PhD • CHRISTOPHER NEVILLE, PT, PhD • JEFF HOUCK, PT, PHD • TYLER CUDDEFORD, PT, PhD
DOMINIC CARREIRA, MD • ROBROY L. MARTIN, PT, PhD, CSCS

Achilles Pain, Stiffness, and Muscle Power Deficits: Midportion Achilles Tendinopathy Revision – 2024

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health from the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association

J Orthop Sports Phys Ther 2024;54(12):CPG1-CPG32. Epub 27 November 2024. doi:10.2519/jospt.2024.0302

REVIEWERS: Christopher Carcia, PT, PhD • Christopher Gnip, PT, DPT, OCS • Karin Grävare Silbernagel, PT, ATC, PhD, FAPTA
Steve Paulseth, PT, DPT, SCS, ATC • Joseph J. Godges, DPT, MA

 Address correspondence to: Clinical Practice Guidelines Managing Editor, APTA Orthopedics, 2920 East Avenue South, Suite 200, La Crosse, WI 54601. E-mail: cpg@orthopt.org

SUMMARY OF RECOMMENDATIONS

INTERVENTIONS – EXERCISE

A Clinicians should use tendon loading exercise, with loads as high as tolerated, as a first-line treatment to improve function and decrease pain for individuals with midportion Achilles tendinopathy who do not have presumed frailty of the tendon structure.

E Individuals using tendon loading exercise for managing their Achilles tendinopathy should exercise at least 3 times a week at an intensity as high as tolerated.

INTERVENTIONS – PATIENT EDUCATION AND COUNSELING

B Clinicians should provide education and counseling on Achilles tendinopathy, with either a pain science or a pathoanatomic focus, in combination with tendon-loading exercise for Achilles tendinopathy. Education and counseling can be provided either in person or via telehealth according to the individual's preference.

B Clinicians should advise that complete rest is not indicated for individuals with midportion Achilles tendinopathy and that they should continue with their activities within their pain tolerance.

INTERVENTIONS – MANUAL THERAPY

F Clinicians may use manual therapy directed at manipulating and/or mobilizing muscles, joints, and/or connective tissues in those with midportion Achilles tendinopathy and mobility deficits.

INTERVENTIONS – DRY NEEDLING

F Clinicians may use intramuscular dry needling to treat calf-related muscle pain and stiffness, particularly in those with more acute symptoms and/or in those who do not tolerate a progressive loading program.

INTERVENTIONS – HEEL LIFTS

C Clinicians may use heel lifts as a therapeutic tool to temporarily reduce ankle dorsiflexion during activity for individuals with midportion Achilles tendinopathy.

INTERVENTIONS – ORTHOSES

D Because contradictory evidence exists, no recommendation can be made for the use of orthoses in individuals with midportion Achilles tendinopathy.

INTERVENTIONS – TAPING

E Clinicians may use therapeutic elastic tape to reduce pain or improve functional performance in individuals with midportion Achilles tendinopathy.

E Clinicians may use rigid taping to decrease strain on the Achilles tendon and/or alter foot posture in individuals with midportion Achilles tendinopathy.

INTERVENTIONS - PHYSICAL AGENTS: LOW-LEVEL LASER THERAPY

C Clinicians should not use low-level laser therapy for individuals with midportion Achilles tendinopathy.

INTERVENTIONS – PHYSICAL AGENTS: THERAPEUTIC ULTRASOUND

C Clinicians should not use therapeutic ultrasound alone to treat Achilles tendinopathy.

INTERVENTIONS – MULTIMODAL INTERVENTIONS

C Clinicians may include multimodal treatment, including a variety of interventions, to enhance the benefits of exercise for those with midportion Achilles tendinopathy.

List of Abbreviations

AOPT: Academy of Orthopaedic Physical Therapy
BMI: body mass index
CI: confidence interval
CPG: Clinical Practice Guideline
ESWT: extracorporeal shockwave therapy
FPI: Foot Posture Index
ICD: International Classification of Diseases
ICON tendinopathy: international tendinopathy consensus group
ICF: International Classification of Functioning, Disability and Health
IV: intravenous

***JOSPT*:** *Journal of Orthopaedic & Sports Physical Therapy*
ISTS: International Scientific Tendinopathy Symposium
MRI: magnetic resonance imaging
NRS: numeric rating scale
PAE: pathoanatomic education
PSE: pain science education
RCT: randomized controlled trial
ROM: range of motion
SD: standard deviation
SMD: standardized mean difference
TENDINS-A: TENDINopathy Severity assessment-Achilles
US: ultrasound imaging
VAS: visual analog scale
VISA-A: Victorian Institute of Sports Assessment – Achilles

INTRODUCTION

AIM OF THE GUIDELINE

The AOPT has an ongoing effort to create evidence-based practice guidelines for orthopaedic physical therapy management of individuals with musculoskeletal impairments described in the World Health Organization's International Classification of Functioning, Disability and Health (ICF).[74] The purposes of these clinical guidelines are to:

- Describe evidence-based physical therapy practice, including diagnosis, prognosis, intervention, and assessment of outcome, for musculoskeletal disorders commonly managed by orthopaedic and sports physical therapists
- Classify and define common musculoskeletal conditions using the World Health Organization's terminology related to impairments of body function and body structure, activity limitations, and participation restrictions
- Identify interventions supported by current best evidence to address impairments of body function and structure, activity limitations, and participation restrictions associated with common musculoskeletal conditions.
- Identify appropriate outcome measures to assess changes resulting from physical therapy interventions in body function and structure, as well as in activity and participation of the individual
- Provide a description to policy makers, using internationally accepted terminology, of the practice of orthopaedic and sports physical therapists
- Provide information for payers and claims reviewers regarding the practice of orthopaedic and sports physical therapy for common musculoskeletal conditions
- Create a reference publication for orthopaedic physical therapy clinicians, academic instructors, clinical instructors, students, interns, residents, and fellows regarding the best current practice of orthopaedic and sports physical therapy

STATEMENT OF INTENT

These guidelines are not intended to be construed or to serve as a standard of care for physical therapists. Standards of care are determined on the basis of all clinical data available for an individual patient and are subject to change as scientific knowledge and technology advance and patterns of care evolve. These parameters of practice should be considered guidelines only. Adherence to them will not ensure a successful outcome for every individual, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgment regarding a particular clinical procedure or treatment plan must be made in light of the clinical presentation, the diagnostic and treatment options available, and the client's values, expectations, and preferences. However, we suggest that significant departures from accepted guidelines should be documented in the medical records at the time the relevant clinical decision is made.

SCOPE AND RATIONALE OF THE GUIDELINE

The 2024 Achilles Pain, Stiffness, and Muscle Power Deficit: Midportion Achilles Tendinopathy Clinical Practice Guideline (CPG) is a revision of the 2018 CPG and represents the third CPG from the Academy of Orthopaedic Physical Therapy (AOPT) on this topic. The terminology used to describe and diagnose tendon injuries has been adapted with current consensus statement so that "tendinopathy" is specifically defined as local pain in the tendon associated with tendon-loading activities.[61] This definition attempts to avoid confusion over any inferred presence of inflammation or degeneration, while noting the specific location and mechanism of pain provocation. Consistent with the original 2010 CPG and 2018 CPG revision, the 2024 CPG update will focus on the clinical entity of midportion Achilles tendinopathy. Midportion Achilles tendinopathy pain is localized >2 cm above the Achilles tendon attachment, while insertional Achilles tendinopathy is identified when pain is localized in the lower portion of the tendon, near its attachment to the calcaneus. While there is some overlap between the 2 types of Achilles tendinopathy, the recommendations from these CPGs are specific to evidence focused on midportion Achilles tendinopathy and may

not generalize to individuals with insertional Achilles tendinopathy. For guidance on insertional Achilles tendinopathy, a Dutch multidisciplinary guideline is a useful resource.[18]

The 2024 CPG revision includes articles published after the search date of November 2017 for the 2018 revision. A review of midportion Achilles tendinopathy as it relates to the topics addressed in the 2018 CPG revision are included, while focusing on new or updated research related to interventions. This 2024 CPG update will answer the question, "What is the evidence to support physical therapy interventions for individuals with midportion Achilles tendinopathy?". The research related to the interventions for midportion Achilles tendinopathy continues to grow with 30 new articles ultimately contributing to this topic.

Prevalence and pathoanatomical features were reviewed in detail in both the original CPG and 2018 CPG revisions and therefore are briefly reviewed in this 2024 update. Midportion Achilles tendinopathy remains a relatively common overuse lower extremity tissue injury for individuals who participate in sports and/or have an increase in their activity level. The overall prevalence of midportion Achilles tendinopathy has been reported between 4% to 7% in a recent meta-analysis with increasing age and higher levels of athletic involvement being associated with a greater prevalence.[72] While the condition affects both athletic and nonathletic populations, the incidence is reportedly higher among individuals who participate in sports that load the Achilles tendon. Runners reportedly have a 40% to 52% chance (cumulative incidence) of having an Achilles tendon injury in their lifetime.[34] Overall, the symptoms associated with Achilles tendinopathy tend to be longstanding and functionally limiting, which leads to the need for medical intervention.

Consensus over key health domains of interest for Achilles tendinopathy include patient rating of the condition, pain on activity/loading, participation (daily activities, work, sport), function, psychological factors, disability, physical function capacity, quality of life, and pain over a specified timeframe.[71] These domains include physical, psychosocial, and overall status/life impact to reflect the nature of Achilles tendinopathy for both the client and physical therapist. The Victorian Institute of Sports Assessment – Achilles (VISA-A) questionnaire has been historically used as a common patient-reported outcome measure for the perceived impact of Achilles tendinopathy.[58] The VISA-A is also included as part of the Core Outcome Set for Achilles tendinopathy to evaluate symptom severity and monitor response to intervention.[17] However, recent concerns over its validity has led to the development of newer instruments, such as the TENDINopathy Severity assessment-Achilles (TENDINS-A) and the VISA-A sedentary.[43,46] These newer instruments may be particularly useful when assessing nonathletes and may over time influence the standards for reporting and interpreting clinical outcomes for those with midportion Achilles tendinopathy.[15,43]

The primary intent of this third CPG on the topic of midportion Achilles tendinopathy is to focus on updating recommendations for interventions to be used in physical therapist practice. Therefore, a systematic review was only conducted for the evidence on physical therapist interventions for those with the diagnosis of midportion Achilles tendinopathy. This CPG excludes interventions outside the scope of physical therapist practice, including but not limited to pharmacological and surgical interventions, unless directly compared to physical therapy management. Although it is used by some physical therapists, extracorporeal shockwave therapy (ESWT) was also considered outside the scope of physical therapist practice for this update. The International Scientific Tendinopathy Symposium (ISTS) provides a source of information in the form of consensus documents to generally inform practice on all topics and serves as an additional source of information.[6,21,57,61,71]

METHODS

Content experts were appointed by the AOPT to conduct a review of the literature and develop an updated CPG for Achilles tendinopathy. This revision aims to provide a concise summary of the contemporary evidence since the publication of the original guideline and to develop new recommendations or revise previously published recommendations to support evidence-based practice. The authors of this guideline revision worked with the CPG editors and medical librarians for methodological guidance. One author (R.L.M.) served as the team's methodologist. The research librarian was chosen for their expertise in systematic review and rehabilitation literature searching and performed systematic searches regarding intervention strategies for midportion Achilles tendinopathy. Briefly, the following databases were searched from November 2017 to March 2024: MEDLINE, CINAHL, Cochrane Library, and PEDro (see **APPENDIX A** for full search strategies and **APPENDIX B** for search dates and results, available at www.orthopt.org). The authors declared relationships and developed a conflict management plan, which included submitting a conflict-of-interest form to the AOPT. Articles that were

authored by a reviewer were assigned to an alternate reviewer. Funding was provided to the CPG development team for travel and expenses for CPG development training by the AOPT. The CPG development team maintained editorial independence from funding agencies, including the AOPT Board of Directors.

Articles contributing to recommendations were reviewed based on specified inclusion and exclusion criteria, with the goal of identifying evidence relevant to physical therapist clinical decision making for individuals with midportion Achilles tendinopathy. The title and abstract of each article were reviewed independently by 2 members of the CPG development team for inclusion (see **APPENDIX C** for inclusion and exclusion criteria, available at www.orthopt.org). Full-text review was then similarly conducted to obtain the final set of articles for contribution to recommendations. The team leader (R.L.M.) provided the final decision on discrepancies that were not resolved by the review team (see **APPENDIX D** for the flowchart of articles, available at www.orthopt.org). Data extraction and assignment of level of evidence were also performed by 2 members of the CPG development team. Evidence tables for this CPG are available on the Clinical Practice Guidelines page of the AOPT website (www.orthopt.org).

This guideline was issued in 2024 based on the published literature through March 7, 2024, and will be considered for review in 2029, or sooner if new evidence becomes available. Any updates to the guideline in the interim period will be noted on the AOPT website (www.orthopt.org).

LEVELS OF EVIDENCE

Individual clinical research articles were graded according to criteria adapted from the Centre for Evidence-Based Medicine, Oxford, United Kingdom, for diagnostic, prospective, and therapeutic studies. In teams of two, each reviewer independently assigned a level of evidence and evaluated the quality of each article using a critical appraisal tool. (See **APPENDICES E** and **F** for the Levels of Evidence table and details on procedures used for assigning levels of evidence, available at www.orthopt.org). The evidence update was organized from the highest level of evidence to the lowest level. An abbreviated version of the grading system is provided below.

I	Evidence obtained from high quality diagnostic studies, prospective studies, systematic reviews, or randomized controlled trials
II	Evidence obtained from lesser-quality diagnostic studies, systematic reviews, prospective studies, or randomized controlled trials (eg, weaker diagnostic criteria and reference standards, improper randomization, no blinding, less than 80% follow-up)
III	Case-control studies or retrospective studies
IV	Case series
V	Expert opinion

STRENGTH OF EVIDENCE AND GRADES OF RECOMMENDATION

The strength of the evidence supporting the recommendations was graded according to the established methods provided below. Each team developed recommendations based on the strength of evidence, including how directly the studies addressed the question relating to midportion Achilles tendinopathy. In developing their recommendations, the authors considered the strengths and limitations of the body of evidence and the health benefits, side effects, and risks of tests and interventions.

Grades of Recommendation		Strength of Evidence	Level of Obligation
A	Strong evidence	A preponderance of level I and/or level II studies support the recommendation. This must include at least 1 level I study	Must or should
B	Moderate evidence	A single high-quality randomized controlled trial or a preponderance of level II studies support the recommendation	Should
C	Weak evidence	A single level II study or a preponderance of level III and IV studies, including statements of consensus by content experts, support the recommendation	May
D	Conflicting evidence	Higher-quality studies conducted on this topic disagree with respect to their conclusions. The recommendation is based on these conflicting studies	
E	Theoretical/ foundational evidence	A preponderance of evidence from animal or cadaver studies, from conceptual models/principles, or from basic sciences/bench research support this conclusion	May
F	Expert opinion	Best practice based on the clinical experience of the guideline's development team	May

GUIDELINE REVIEW PROCESS AND VALIDATION

Identified reviewers who are experts in midportion Achilles tendinopathy management and rehabilitation reviewed the CPG draft for integrity and accuracy, and to ensure that it fully represented the current evidence for the condition. The guideline draft was also posted for public comment and review on www.orthopt.org and a notification of this posting was sent to the members of the APTA. In addition, reviewers were invited from a panel including consumer/patient representatives and external stakeholders, claims reviewers, medical coding experts, academic educators, clinical educators, physician specialists, researchers, and CPG methodologists. All comments, suggestions, and feedback from the reviews, were provided to the authors and editors for consideration and revisions. Guideline development methods policies, and implementation processes are reviewed at least yearly by APTA's Clinical Practice Guideline Advisory Panel.

DISSEMINATION AND IMPLEMENTATION TOOLS

In addition to publishing this CPG in the Journal of Orthopaedic & Sports Physical Therapy (JOSPT), it will be posted on the CPG website pages of both the JOSPT and the APTA, which are free access website areas, and submitted to be made available free access on the ECRI Guidelines Trust (guidelines.ecri.org) and the Physiotherapy Evidence Database (PEDro.org.au). The planned implementation tools for patients, clinicians, educators, payors, policy makers, and researchers, and the associated implementation strategies are listed in the **TABLE**.

ORGANIZATION OF THE GUIDELINE

Prevalence and pathoanatomical features for midportion Achilles tendinopathy are briefly reviewed in the introduction. The 2018 CPG summaries are restated for risk factors, clinical course, diagnosis, and imaging and followed by an evidence update and new 2024 summaries. The 2018 summary differential diagnoses as well as the examination recommendations for outcome measures, activity/participation restriction measures, and physical impairment measures are not updated and therefore restated. Related to physical therapy interventions for those with midportion Achilles tendinopathy, a systematic review was conducted to identify randomized controlled trials (RCTs) or systematic reviews and meta-analyses of RCTs that support specific actionable recommendations. When appropriate, the prior 2018 recommendation was provided, followed by a summary of updated literature with the corresponding evidence levels, synthesis of evidence, and rationale for the recommendation(s) with harms and benefits statements, gaps in knowledge, and updated recommendation(s).

CLASSIFICATION

The International Classification of Diseases (ICD-10) code associated with Achilles tendinopathy is M76.6 Achilles tendinitis/Achilles bursitis. The primary ICF body function codes associated with Achilles tendinopathy are b28015 Pain in lower limb, b7300 Power of isolated muscles and muscle groups, and b7800 Sensation of muscle stiffness. The primary ICF body structures codes associated with Achilles tendinopathy are s75012 Muscles of lower leg and s75028 Structure of ankle and foot, specified as Achilles tendon. The primary ICF activities and participation codes associated with Achilles tendinopathy are d4500 Walking short distances, d4501 Walking long distances, d4552 Running, d4553 Jumping, and d9201 Sports. A comprehensive list of codes was published in the previous guideline.

TABLE Planned Strategies and Tools to Support the Dissemination and Implementation of This Clinical Practice Guideline

Tool	Strategy
"Perspectives for Patients"	Patient-oriented guideline summary available on www.jospt.org and www.orthopt.org
Mobile application of guideline-based exercises for patient/clients and health care practitioners	Marketing and distribution of app using www.orthopt.org
Clinician's Quick-Reference Guide	Summary or guideline recommendations available on www.orthopt.org
Read-for-credit continuing education units	Continuing education units available for physical therapists and athletic trainers from *JOSPT*
Webinars educational offering for health care practitioners	Guideline-based instruction available for practitioners on www.orthopt.org
Mobile and web-based app of guideline for training of health care practitioners	Marketing and distribution of app using www.orthopt.org
Non-English versions of the guidelines and guideline implementation tools	Development and distribution of translated guidelines and tools to JOSPT's international partners and global audience via www.jospt.org
APTA CPG+	Dissemination and implementation aids

Abbreviation: APTA, American Physical Therapy Association; CPG, clinical practice guideline.

IMPAIRMENT/FUNCTION-BASED DIAGNOSIS

Risk Factors

2018 CONDENSED SUMMARY

The body's response to loading will be influenced by health conditions, drug use, and genetic factors. An individual with any number of lower extremity impairments that lead to abnormal kinetics and/or kinematics that specifically produce an eccentric overload of the Achilles tendon may be at risk for Achilles tendon injury.

EVIDENCE UPDATE

While Achilles tendinopathy is common, its etiology remains unclear and risk factors leading to the condition remain understudied. The risk of developing midportion Achilles tendinopathy is likely multifactorial and related to an interaction of intrinsic and extrinsic factors that lead to tendon overloading. A systematic review by van der Vlist et al[69] included 10 cohort studies and identified 9 risk factors. The 9 risk factors included: (1) prior lower limb tendinopathy or fracture, (2) use of ofloxacin (quinolone) antibiotics, (3) an increased time between heart transplantation and initiation of quinolone treatment for infectious disease, (4) moderate alcohol use, (5) training during cold weather, (6) decreased isokinetic plantar flexor strength, (7) abnormal gait pattern with decreased forward progression of propulsion, (8) more pressure on the lateral side of the plantar surface of the foot while running, and (9) creatinine clearance of <60 mL/min in heart transplant patients.[69] It is interesting to note that 26 other commonly identified risk factors were not associated with Achilles tendinopathy in this systematic review.[69] These noncontributory risk factors included being overweight, abnormal static foot posture, and physical activity level.[69] Overall, there remains a high risk of bias in studies identifying risk factors making definitive clinical recommendations difficult, but quinolone treatment, alcohol consumption, and ankle plantar flexor strength are modifiable factors that may be useful for patient education purposes.

2024 SUMMARY

The body's response to loading is influenced by prior injuries, health conditions, drug use, and genetic factors. An individual with changes in training (intensity, duration, environment) and/or any number of lower extremity impairments that lead to abnormal kinetics and/or kinematics that specifically produce an overload of the Achilles tendon may be at risk for Achilles tendon injury.

Clinical Course

2018 CONDENSED SUMMARY

Recovery time can vary from brief to many months and is probably dependent on the severity of the injury and influenced by intrinsic factors. While most patients will improve, mixed levels of recovery can be anticipated.

EVIDENCE UPDATE

There is still a gap in information on the typical course of recovery for individuals with midportion Achilles tendinopathy and factors that may influence the magnitude and timing of recovery. A cohort study by Hanlon et al[25] found that individuals with acute midportion Achilles tendinopathy (≤3 months duration) had a similar level of improvement in symptoms, function, tendon structure, and psychological factors as individuals with chronic midportion Achilles tendinopathy (symptom duration categorized as ≥3 to <6 months, between ≥6 months and <12 months, and ≥12 months). Therefore, symptom duration (acute versus chronic) may not be a key factor in predicting the response to tendon loading exercise. Symptom irritability can be a specifically relevant factor clinicians need to recognize when developing exercise prescription for Achilles tendinopathy. For example, aggressive high tendon loading programs may be poorly tolerated in the early stages for individuals with high symptom irritability. Progressive loading programs that consider total loading throughout the day may be ways to achieve increased loading as symptom irritability changes with treatment.

Psychosocial factors may also influence recovery, yet to date, most research on the effect of psychosocial factors on pain is from other musculoskeletal pain conditions.[6] The international tendinopathy consensus group (ICON tendinopathy) has included psychosocial factors as one of the 9 core health domains for tendinopathy, indicating consensus on the importance to assess for psychological factors.[71] An international Delphi study including expert clinicians, researchers, and individuals with Achilles tendinopathy identified 4 key psychosocial factors to consider in individuals with tendinopathy: fear of movement, pain beliefs, pain-related self-efficacy, and fear avoidance.[67] To date fear of movement, known as kinesiophobia, has been the factor most studied in individuals with Achilles tendinopathy. Studies have shown mixed results about how kinesiophobia affects people with Achilles tendinopathy. A cross-sectional study by Murakawa et al[41] found no relationship between kinesiophobia and severity of Achilles tendinopathy symptoms on the VISA-A. In contrast, a cross-sectional study by Janowski et al[27] reported that individuals with higher kinesiophobia had higher movement-evoked pain with tendon-loading activities. In a longitudinal study by Alghamdi et al,[3] higher kinesiophobia was associated with worse symptom severity at baseline yet did not predict recovery. In summary, the influence of psychosocial factors on the recovery from midportion Achilles tendinopathy is still not fully understood. However, it should be acknowledged that psychosocial factors may affect the recovery process, which is different for each person.

The clinical course of midportion Achilles tendinopathy likely depends on a multitude of factors. A prospective study by Hanlon et al identified 4 clinical profiles based on identified impairments, including Activity-dominant, Function-dominant, Psychosocial-dominant, and Structure-dominant, that had different trajectories of recovery with rehabilitation over 6 months. The subgroups were defined based on 5 factors: (1) lower extremity function (eg, heel rise endurance), (2) patient-related factors (eg, body mass index [BMI]), (3) symptom severity (eg, VISA-A), (4) psychosocial factors (ie, Tampa Scale of Kinesiophobia), and (5) tendon morphology (eg, tendon thickness). Activity- and Function-dominant groups had greater functional recovery than the Psychosocial- and Structure-dominant groups.[25]

2024 SUMMARY

While most individuals will improve, the extent of recovery and time to recover can vary between individuals. Recovery from midportion Achilles tendinopathy is likely influenced by a combination of biological factors (eg, tendon structure, BMI), motor function (eg, lower extremity muscle strength and endurance), psychosocial factors (eg, fear of movement), and severity of disability (eg, VISA-A).

Diagnosis

2018 RECOMMENDATION

In addition to the arc sign and Royal London Hospital test clinicians can use a subjective report of pain located 2 to 6 cm proximal to the Achilles tendon insertion that began gradually and pain with palpation of the midportion of the tendon to diagnose midportion Achilles tendinopathy.

EVIDENCE UPDATE

A Dutch multidisciplinary guideline for the diagnosis of midportion Achilles tendinopathy was developed by de Vos et al.[18] The diagnosis of midportion Achilles tendinopathy is made using the presence/absence of the following 4 criteria.[18]

1. Symptoms are localized to the midportion of the Achilles tendon
2. Achilles tendon pain is provoked by tendon-loading activities
3. Pain with palpation of the Achilles tendon midportion
4. Localized thickening of the Achilles in the midportion region of the tendon in more chronic conditions (may be absent)[63]

The above diagnostic criteria are consistent with the 2018 recommendation with criteria 3 and 4 aligning with the special tests of the Royal London Hospital test and Arc Sign. Further localized thickening may help with ruling in a diagnosis of Achilles tendinopathy but may be absent in approximately a quarter of individuals with Achilles tendinopathy.[63] An important addition to the diagnostic criteria is that Achilles tendinopathy pain is provoked by tendon-loading activities, indicating an emphasis on movement-evoked pain.[18]

2024 SUMMARY

The diagnosis of midportion Achilles tendinopathy is primarily based on clinical exam with symptoms located in the midportion of the Achilles tendon, pain provoked by tendon-loading activities, tenderness in the midportion region of the Achilles tendon that change with ankle plantar and dorsiflexion (ie, positive arc sign and Royal London Hospital test). Localized thickening of the tendon also assists with ruling in the diagnosis but may be absent in some individuals with Achilles tendinopathy.

Differential Diagnosis

2018 SUMMARY

Clinicians should consider diagnostic classifications other than midportion Achilles tendinopathy when the patient's reported activity limitations or impairments of body function and structure are not consistent with those presented in the Diagnosis, Classification, and Clinical Course sections of this updated guideline, or when the patient's symptoms are not resolving with interventions aimed at normalization of the patient's impairments of body function. The following conditions should be considered in the differential diagnosis of patients presenting with nontraumatic posterior ankle pain:

- Partial tear of the Achilles tendon[11,31]
- Retrocalcaneal or subcutaneous bursitis[30]
- Posterior ankle impingement[8]
- Irritation or neuroma of the sural nerve[2]
- Tibial or calcaneal stress fractures

- Os trigonum syndrome[68]
- Accessory soleus muscle[36]
- Achilles tendon ossification[56]
- Systemic inflammatory disease[4]
- Plantaris tendon involvement[49]
- Paratenonitis[24]
- Fascial tears[49]
- Insertional Achilles tendinopathy

Examination

OUTCOME MEASURES

2018 Recommendation

Clinicians should use the VISA-A to assess pain and stiffness, and either the Foot and Ankle Ability Measure or the Lower Extremity Functional Scale to assess activity and participation in patients with a diagnosis of midportion Achilles tendinopathy.

ACTIVITY LIMITATIONS

2018 Recommendation

Clinicians should use physical performance measures, including hop and heel-raise endurance tests as appropriate, to assess a patient's functional status and document findings.

Physical Impairments

2018 RECOMMENDATION

When evaluating physical impairment over an episode of care for those with Achilles tendinopathy, one should measure ankle dorsiflexion range of motion, subtalar joint range of motion, plantar flexor strength and endurance, static arch height, forefoot alignment, and pain with palpation.

FOOT AND ANKLE EXAMINATION OUTLINE

2024 Summary

To assist with the collection of body structure limitation measures, the authors of the 2024 CPG recommend the components of the foot and ankle specific examination outlined in the Heel Pain-Plantar Fasciitis Revision.[33] In addition, a Core Outcome Set for Achilles tendinopathy has been recommended to evaluate symptom severity and monitor response to intervention[17] The Core Outcome Set includes the VISA-A, the single-leg heel rise endurance test, and movement-evoked pain with tendon loading activities.[17] It should be noted that a comprehensive lower quarter screen can be performed if needed based on the individual's presentation.

Supine passive ROM[a]	Dorsiflexion knee extended
	Dorsiflexion knee flexed
	Plantar flexion
	Supination/inversion
	Pronation/eversion
	Great toe extension
MMT	Tibialis anterior
	Tibialis posterior
	Fibularis longus and brevis
Weight-bearing testing[b]	Case-control studies or retrospective studies
	Functional loading testing: - Drop landing - Hopping
	Single-leg heel rise (repetition and height) for plantar flexor muscle endurance
	Dorsiflexion lunge test for tibio-pedal dorsiflexion ROM
	Foot Posture Index (FPI)-6
	Single-leg squat
	Gait
Special tests	Royal London Hospital Test
	Painful arc sign
Palpation	Pain and thickening along the course of the Achilles tendon
	Body of the calcaneus for stress fracture
	Posterior aspect of the calcaneus for insertional Achilles tendinopathy

Abbreviations: MMT, manual muscle testing; ROM, range of motion.
[a]Joint mobility assessment when deficits are identified.
[b]Movement-evoked pain can be assessed during and after tendon loading activities (eg, gait, heel rises, hopping) by asking individuals to rate pain in the Achilles tendon (Verbal Numeric Rating Scale: 0-10).

DIAGNOSTIC IMAGING

2018 Condensed Summary

Ultrasound imaging and magnetic resonance imaging (MRI) may be useful in assessing for differential diagnoses and

identifying coexisting pathology, such as partial ruptures, bursitis, paratenonitis, plantaris involvement, and/or fascial tears, in patients with signs and symptoms inconsistent with Achilles tendinopathy or who have chronic pain not responding to conservative intervention.

2024 Update

Imaging is not required to diagnose Achilles tendinopathy,[18,61] but recommended when the diagnosis is uncertain, there is a delayed response to care, or when invasive treatments are being considered.[18] Diagnostic imaging can rule in Achilles tendinopathy by visualizing the tendon tissue to evaluate for other diagnoses, such as a partial tear or paratenonitis.[24] A common sign of pathology is increased tendon thickness, which is present in 73% of individuals with Achilles tendinopathy.[63] Yet the positive identification of increased tendon thickness is not specific to Achilles tendinopathy, as up to a quarter of asymptomatic adults have increased Achilles tendon thickness.[23,52,63] Notably, normative values for Achilles tendon thickness take into account age, height, BMI, and sex.[63] Therefore, diagnostic imaging findings should be interpreted within the context of an individual's demographics and clinical exam findings. The Dutch multidisciplinary guideline by de Vos et al[18] recommends imaging for Achilles tendinopathy when there is uncertainty in the diagnosis, if there is a delayed recovery, negative change in symptoms over the course of care, or if a procedure is being considered. Ultrasound, radiographs, and MRI are commonly used diagnostic imaging techniques for Achilles tendinopathy. Each technique has its own advantages and disadvantages, depending on the individual's clinical presentation and response to conservative care. Ultrasound, including B-mode, Doppler, and elastography, is the recommended imaging method for Achilles tendinopathy by the Dutch multidisciplinary guideline.[18] Ultrasound imaging can visualize soft tissues in real time, with low cost, low risk, and high accessibility. For ankle pain in general, radiographs are the first-line imaging method, according to the American College of Radiology (https://www.acr.org/ClinicalResources/ACR-Appropriateness-Criteria). Radiographs can identify any bone-related problems, such as calcaneal fractures, os trigonum, enthesophytes, and Haglund's morphology, which may contribute to differential diagnoses particularly around the insertion of the Achilles tendon. If the radiographs are normal and tendon abnormality is suspected, then the American College of Radiology guidelines recommend ultrasound or MRI without IV contrast. Because MRI is relatively expensive and less accessible, this technique is commonly reserved for specific situations, such as surgical planning. Thus, ultrasound imaging or radiographs may be used to enhance clinical examination, ultimately the selection of will depend on the benefits, risks, cost, and accessibility of each imaging option.

2024 Summary

Imaging, in the form of ultrasound and radiographs, or MRI, for Achilles tendinopathy is recommended when there is uncertainty in the diagnosis, if there is a delayed recovery, if there is negative change in symptoms over the course of care, or if a procedure is being considered.

Interventions

EXERCISE

2018 Recommendation

A Clinicians should use mechanical loading, which can be either in the form of eccentric or a heavy-load, slow-speed (concentric/eccentric) exercise program, to decrease pain and improve function for patients with midportion Achilles tendinopathy without presumed frailty of the tendon structure.

F Patients should exercise at least twice weekly within their pain tolerance.

Evidence Update

Exercise for this 2024 CPG update is described as tendon loading. These tendon loading exercises encompass eccentric, concentric, isometric, isotonic, and plyometric use of the plantar flexors. A progressive tendon loading exercise program increases the exercise intensity based on an individual's pain tolerance and/or functional capacity.

Exercise vs Wait-and-See

II Tendon loading exercise improves function and reduces pain, as reported in 3 systematic reviews.[28,42,48] Further, 3 additional systematic reviews found that tendon loading exercise is more beneficial than a wait-and-see approach.[45,55,70] A total of 13 RCTs were included in the most recent systematic review by van der Vlist et al.[70] This network meta-analysis reported that that exercise improved function by 20 points (95% confidence interval [CI]: 11, 30 points) more on the VISA-A than a wait-and-see approach.

Exercise vs Nonexercise

I An RCT by Al-ani et al[2] (N = 38, Age = 49.2 ± 8.8 years, 55% women) found that radiofrequency microtenotomy decreased pain to a lower intensity (1.1 ± 1.4 on a 0-10 numeric rating scale [NRS]) than eccentric exercise (3.1 ± 1.8) at 2-year follow-up.

I An RCT by Gatz et al[19] reported a similar level of improvement in function when comparing ESWT combined with tendon-loading exercise versus exercise alone (N = 66, Age = 46 years [range: 22–73], 61% men). The study compared 2 different active ESWT techniques to a placebo ESWT technique and all participants were instructed in tendon-loading exercise (eccentric and isometric) and stretching by a physician. No statistically significant differences in improvement in function were found between groups with improvements ranging from 15 to 23 points on the VISA-A and high variability (standard deviation [SD] of 17 to 18 per group).[19]

II A systematic review by Charles et al[12] reported that tendon loading exercise results in similar improvements in function (standardized mean difference [SMD], 0.39; 95% CI: −0.13, 0.91; favoring ESWT) and pain (SMD, −0.34; −0.83, 0.15; favoring ESWT) compared to ESWT alone based on findings from 6 studies.[12] Similarly, a network meta-analysis by van der Vlist et al[70] reported no difference in function between exercise versus ESWT (mean difference on the VISA-A, −5; 95% CI: −15, 5; favoring exercise).

II In a systematic review, Murphy et al[45] identified 2 RCTs with a combined sample size of 45 participants comparing exercise to passive treatments. The analysis indicated that eccentric exercise led to a 17.7-point greater improvement (95% CI: 3.8, 31.7) on the VISA-A compared to deep friction massage and ultrasound.[45]

II van der Vlist et al[70] conducted a network meta-analysis reporting that acupuncture, as measured by 1 study, improved function more than tendon loading exercise (15-points on the VISA-A, 95% CI: 11, 19).

II A systematic review by Maetz et al[38] reported no differences in functional improvement on the VISA-A between exercise and nonexercise interventions (pooled mean difference at short-term follow-up, −7.9; 95% CI: −16.0, 0.2; pooled mean difference at long-term follow-up, −6.8; 95% CI: −14.2, 0.7; favoring exercise). Nonexercise interventions provided a higher level of pain relief (visual analog scale [VAS], 0-100 scale) in the short term (pooled mean difference, 10.2; 95% CI: 2.2, 18.3) than exercise interventions.[38] Yet this difference may not be clinically meaningful and the statistical significance of this effect was not maintained at midterm (pooled mean difference, 10.0; 95% CI: −2.7, 22.6) or long-term (pooled mean difference, 9.6; 95% CI: 17.0, 36.2) follow-up.[38] The number of studies included at each time point ranged from 2 to 5 studies, and exercise interventions were a mix of noninvasive and invasive treatments, including radiofrequency ablation, passive stretching plus a dietary supplement, therapeutic ultrasound, platelet-rich plasma, heel lift, prolotherapy, and acupuncture.

Eccentric exercise vs Other Loading Exercise

II Tendon loading exercise provided a moderate to large benefit on function and pain across a variety of the exercise dosing parameters and loading types, as reported in 2 systematic reviews that each included 7 clinical trials.[26,75] Similarly, a meta-analysis by Prudencio et al[51] found no differences in pain between eccentric and other types of exercise (mean difference, −1.2; 95% CI: −2.7, 0.30). In line with those systematic reviews, a more recently published low-level RCT by Habets et al[22] on 40 recreational athletes (mean age = 47.3 [9.6] years, 45% women) reported no differences in clinical outcomes between the eccentric exercise protocol compared to the progressive tendon loading exercise protocol (VISA-A: 2.4 [95% CI: −8.5, 13.3]).

II An RCT by Radovanovic et al[54] compared high-load isometric exercise (n = 15) to the Alfredson eccentric exercise protocol (n = 15) and passive treatments only (n = 14) in men with chronic Achilles tendinopathy (Age = 40.3 years (range: 24-55), 100% men). The study found that the high-load isometric exercise, performed 4 days per week with 5 sets of 4 repetitions at 90% maximum voluntary contraction with a neutral ankle position, had the greatest improvement in maximum voluntary contraction (mean, 7.2%; SD, 9.9), increase in tendon stiffness (mean, 20.1%; SD, 20.5), decrease in maximum tendon strain (mean, −12.4%; SD, 10.3), and increase in tendon cross-sectional area (mean, 9.0%; SD, 5.8) compared to the other groups.[54] Interestingly, all 3 groups had a similar level of improvement in function (VISA-A increased by 19.8 [SD, 15.3]) and pain (verbal NRS decreased by 0.6 [SD, 0.9]).[54]

II Specific to plantar flexor muscle structure and/or function, a systematic review by Murphy et al[44] included 17 studies and 25 cohorts, with only 4 cohorts reporting improvement.

II A systematic review by Kim et al[32] found that improvements in peak torque and jump height were most commonly reported in eccentric exercise programs. Yet the authors noted that there was insufficient evidence comparing different types of exercise (eccentric only, concentric only, combined) to conclude that one type of

exercise provided superior benefits on motor outcomes.[32] The review included ten studies that were only summarized qualitatively due to heterogeneity.

Evidence Synthesis

The positive effects of exercise on function are clinically meaningful, with studies showing improvement as soon as 2 weeks and an improvement of 18 to 21 points on the VISA-A scale by 12 weeks.[42,45,55,70] Tendon loading exercise is effective at reducing pain and improving function for individuals with Achilles tendinopathy, despite variation in the type of loading (eccentric, heavy-load, slow-speed, progressive, and isometric) and dosing (exercise frequency, number of sessions, duration of care).[26,42,45,55,70,75] Therefore, clinicians are not restricted to only using eccentric exercise as multiple types of exercise are effective, as further supported by 2 recent meta-analyses, not included in the current summary due to overlap of studies reported in previous guidelines.[45,47,73] Moreover, exercise frequency (range: once per day to 3 times per week), total number of sessions (range: 24-168), and duration of care (range: 6 weeks to 6 months) did not seem to influence clinical outcomes.[75] Exercise provides a high level of benefit with minimal risks as an intervention for chronic Achilles tendinopathy, with the most commonly reported harm being temporary symptom aggravation.[13,28]

Exercise appears to be better than a wait-and-see approach or the use of passive treatments alone.[45,55,70] Exercise may provide a similar level of benefit compared to ESWT.[12,19] Invasive techniques, including microtenotomy and acupuncture, may provide superior benefits compared to exercise.[1,70] Yet the level of evidence provided by systematic reviews comparing exercise to other treatments are commonly limited by a single study being used to estimate the effect of the comparison intervention, the included studies having a high risk of bias, and/or small sample sizes.[38,45,51,55,70]

Gaps in Knowledge

The efficacy of exercise over a wide range of exercise types and dose combined with inconsistent improvements in plantar flexor muscle structure and function highlights the need for further research.[44] Exercise likely provides multidimensional benefits on tendon structure,[1,7,54] motor function,[32,54] and psychological factors.[13] There is a gap in the literature on which parameters of exercise are most important to maximize the short-term improvement in symptoms and maintain long-term tendon health and function.

The benefits of tendon-loading exercise for pain and function are well established, yet there is variability in the degree of improvement between individuals. To date, studies mostly represent nonacute Achilles tendinopathy with pain >3 months and individuals who are physically active. Therefore, generalization is limited for individuals with acute duration of symptoms and who have a low level of physical activity. Future work is needed to determine if the identification of specific patient subgroups, based on demographics, types of impairment and/or pain mechanisms, can be used to optimize the selection and timing of treatments.

2024 Recommendation

A Clinicians should use tendon loading exercise, with loads as high as tolerated, as a first-line treatment to improve function and decrease pain for individuals with midportion Achilles tendinopathy who do not have presumed frailty of the tendon structure.

E Individuals using tendon loading exercise for managing their Achilles tendinopathy should exercise at least 3 times a week at an intensity as high as tolerated.

STRETCHING

2018 Recommendation

C Clinicians may use stretching of the ankle plantar flexors with the knee flexed and extended to reduce pain and improve satisfaction with outcome in patients with midportion Achilles tendinopathy who exhibit limited ankle dorsiflexion range of motion.

Evidence Update

None.

2024 Recommendation

Unchanged.

NEUROMUSCULAR RE-EDUCATION

2018 Recommendation

F Clinicians may use neuromuscular exercises targeting lower extremity impairments that may lead to abnormal kinetics and/or kinematics, specifically eccentric overload of the Achilles tendon during weight-bearing activities.

Evidence Update

None.

Gaps in Knowledge

Neuromuscular re-education can be an ambiguous term. Therefore, for this CPG, we have considered neuromuscular re-education as functional exercise that incorporates range of motion, strengthening, proprioception, and/or motor control. Further research is needed to examine the effectiveness of this type of intervention for midportion Achilles tendinopathy.

2024 Recommendation
Unchanged.

PATIENT EDUCATION AND COUNSELING
2018 Recommendation
B For patients with nonacute midportion Achilles tendinopathy, clinicians should advise that complete rest is not indicated and that they should continue with their recreational activity within their pain tolerance while participating in rehabilitation.

E Clinicians may counsel patients with midportion Achilles tendinopathy. Key elements of patient counseling could include (1) theories supporting use of physical therapy and role of mechanical loading; (2) modifiable risk factors, including BMI and shoe wear; and (3) typical time course for recovery from symptoms.

Evidence Update
For this 2024 CPG, education is operationally defined as interactive learning aimed at the following: (1) knowledge about the condition, treatments, and preventative measures; (2) attitudes toward treatment and behavioral change; (3) engagement in care decisions and adherence to treatment plans; and (4) skill development to promote self-care to maximize health outcomes. For this, CPG education and counseling were combined.

I The type of education provided along with exercise did not alter clinical outcomes for individuals chronic Achilles tendinopathy.[13] In an RCT by Chimenti et al (N = 66, 44% midportion Achilles tendinopathy, Age = 43.4 ± 15.5 years, 56% women), there were no differences between those randomized to pain science education (PSE) or pathoanatomic (PAE) education in the reduction in pain at 8 weeks (NRS of 0-10; PSE: −3.0 [95% CI: −3.8, −2.2], PAE: −3.6 [95% CI: −4.4 to −2.8]) or improvement in function at 12 weeks (VISA-A; PSE: 23.4 [95% CI: 17.1, 29.7], PAE: 20.0 [95% CI: 13.6, 26.3]). Pain science education focused on information to help reduce fear of movement with exercise and pain catastrophizing related to imaging findings. In contrast, the pathoanatomic education provided more general evidence-based information about Achilles tendinopathy, including terminology, symptoms, and common imaging findings. Education likely contributed to positive outcomes, as greater improvements in self-efficacy and in knowledge gain were associated with greater pain relief (β = −0.06; 95% CI: −0.10, −0.02) and higher function (β = 3.87; 95% CI: 1.68, 6.06), respectively. Additionally, compared to in-person, providing this intervention via telehealth or a hybrid approach was not inferior (mean difference in pain for in-person vs telehealth = 0.5 [95% CI: −1.1, 2.0] vs hybrid = 0.5 [95% CI: −1.0, 1.9], favoring telehealth/hybrid).[50]

II An RCT by Cil et al reported that a web-based rehabilitation program, delivered through a web or smartphone interface, was as effective as in-person information delivery with or without hands-on manual therapy (N = 38, Age = 33.0 ± 10.1 years, 58% men).[14] All 3 groups learned home-based progressive exercises, performed stretches, and had manual therapy (either self-myofascial release or manual therapy provided by a physical therapist).

Evidence Synthesis
Education that emphasizes biopsychosocial aspects of Achilles tendinopathy pain is equally as effective as education that emphasizes biomedical aspects.[13] Education combined with exercise can be effectively delivered in person, virtually via telehealth, and/or using a hybrid approach.[14,50] Together, these findings indicate that clinicians can tailor educational content and format to enable individualization of care to their clinical presentation and their preferences.

Gaps in Knowledge
While education is considered a key component of rehabilitation for Achilles tendinopathy,[18] there is a lack of guidance on best practices for content and duration of education. Education topics commonly include (1) terminology (eg, tendinopathy vs tendinitis vs rupture); common symptoms, diagnosis, and expected recovery timeline[42]; (2) the importance of exercise over complete rest[62] and the benefits of physical activity for decreasing and managing pain in the long term[13]; (3) self-management strategies for symptom relief, such as pain monitoring to guide level of activity and activity modification[62]; (4) how biological, psychological, and social factors interact to influence pain[13]; and (5) alternative and adjunct treatment options.[18]

2024 Recommendation
B Clinicians should provide education and counseling on Achilles tendinopathy, with either a pain science or a pathoanatomic focus, in combination with tendon-loading exercise for Achilles tendinopathy. Education and counseling can be provided either in person or via telehealth according to the individual's preference.

B Clinicians should advise that complete rest is not indicated for individuals with midportion Achilles tendinopathy and that they should continue with their activities within their pain tolerance.

MANUAL THERAPY
2010 Recommendation
F Clinicians may use joint and soft tissue mobilization to reduce pain and improve mobility and function in patients with midportion Achilles tendinopathy.

2018 Recommendation

F

Clinicians may consider using joint mobilization to improve mobility and function and soft tissue mobilization to increase range of motion for patients with midportion Achilles tendinopathy.

Evidence Update

II

An RCT by Stefansson et al[66] compared eccentric exercise (n = 19), pressure massage (n = 21) and both eccentric exercise and pressure massage (n = 20) (Age = 44.8 ± 11.3 years, 80% men). There was a similar level of improved function with the mean VISA-A score above 80 out of 100 by 24 weeks for all 3 groups.[66] There was not a consistent improvement in ankle dorsiflexion (mean increase <3 degrees for all follow-up time points and groups).[66] This study only reported *P* values.

Evidence Synthesis

There continues to be an absence of evidence to either support or contradict the effectiveness of manual therapy directed at manipulating and/or mobilizing muscles, joints, and/or connective tissues. One low-level RCT found pressure massage, defined as massage focused on 3 to 4 tender and/or trigger points in the plantar flexor muscles, as a stand-alone to be beneficial.[66] Based on expert opinion and an impairment-driven treatment model, it is believed that manual therapy is appropriate to address range-of-motion restrictions in the foot and ankle region in those with midportion Achille tendinopathy. No major harm for manual therapy applied to the lower extremities have been reported.

Gaps in Knowledge

High-quality studies are needed to study the effectiveness of manual therapy in those with midportion Achilles tendinopathy.

2024 Recommendation

F

Clinicians may use manual therapy directed at manipulating and/or mobilizing muscles, joints, and/or connective tissues in those with midportion Achille tendinopathy and mobility deficits.

DRY NEEDLING

2018 Recommendation

F

Clinicians may use combined therapy of dry needling with injection under ultrasound guidance and eccentric exercise to decrease pain for individuals with symptoms greater than 3 months and increased tendon thickness.

Evidence Update

For this 2024 CPG, dry needling is operationally defined as a therapeutic technique that involves inserting a thin, solid needle to release a muscle trigger point or muscle tenderness.

II

In an RCT by Solomons et al,[64] individuals were assigned to either intramuscular stimulation (muscle individualized for each participant based on their assessment) (n = 25), sham intramuscular stimulation (n = 19), or exercise only (n = 8). All groups received a standardized 12-week progressive eccentric exercise program. There were no differences in improvement in the VISA-A between any of the groups at weeks 6, 12, 26, or 52.[64]

Evidence Synthesis

One small RCT found that there was no additional benefit of adding intramuscular dry needling, with or without stimulation, to tendon loading exercise. No severe harms were reported in this study.[64] Most participants experienced a deep ache and/or muscle contraction with needle insertion. Occasionally, minor bruising was associated with dry needling.[64] There is currently a lack of high-quality studies specific to the Achilles tendinopathy population on this intervention.[20,29] Dry needling may have a place in improving pain and range of motion, particularly in those with more acute symptoms, myofascial trigger points in the calf, and/or those who do not tolerate a progressive loading program.

Gaps in Knowledge

Intramuscular dry needling has not been tested in conjunction with other modalities or as a stand-alone treatment. Additionally, high-quality studies that assess a variety of dry needing dosages are needed to determine the potential risks and benefits of this intervention for midportion Achilles tendinopathy.

2024 Recommendation

F

Clinicians may use intramuscular dry needling to treat calf-related muscle pain and stiffness, particularly in those with more acute symptoms and/or in those who do not tolerate a progressive loading program.

HEEL LIFTS

2018 Recommendation

D

Because contradictory evidence exists, no recommendation can be made for the use of heel lifts in patients with midportion Achilles tendinopathy.

Evidence Update

II

Rabusin et al[53] compared the efficacy of heel lifts to an eccentric exercise program in an RCT (N = 100, Age = 45.9 ± 9.4 years, 52% women). The heel lifts were used bilaterally, placed in up to 3 pairs of shoes that were most worn, had a height of 12 mm, and were made from firm material of multilayer vinyl. Participants received instructions for completing the intervention by a handout. By 12 weeks, the heel lift group reported a higher level of function (83.0 ± 16.9 on the VISA-A) and less pain (18.1 ± 23.2 on

the VAS, scale of 0-100 mm) compared to the eccentric exercise group (VISA-A: 70.7 ± 22.2, VAS: 37.6 ± 31.1).[53] The heel lift group also reported a higher level of adherence (91%) compared to the eccentric exercise group (60%).[53] There were no adverse events from participating in either intervention. There was a similar adverse event rate in both groups with 45% of participants self-reporting the development of a new pain in the low back and/or lower extremities.

Evidence Synthesis

The 2010 CPG reported a lack of benefit from viscoelastic heel lifts that were designed to provide shock absorption.[9] In contrast, the study by Rabusin et al[53] used firm heel lifts 12 mm in height that were designed to reduce the amount of ankle dorsiflexion range of motion needed for daily and sporting activities. Compared to tendon loading exercise, heel lifts are easier to adhere to and have a similarly low level of risk.

Gaps in Knowledge

There are minimal high-quality studies from which to draw clinical recommendations for heel lift height and progression for reducing the height and/or duration of use.

2024 Recommendation

C — Clinicians may use heel lifts as a therapeutic tool to temporarily reduce ankle dorsiflexion during activity for individuals with midportion Achilles tendinopathy.

NIGHT SPLINTS

2018 Recommendation

C — Clinicians should not use night splints to improve symptoms in patients with midportion Achilles tendinopathy.

Evidence Update

None.

2024 Recommendation

Unchanged.

ORTHOSES

2018 Recommendation

D — Because contradictory evidence exists, no recommendation can be made for the use of orthoses in patients with midportion Achilles tendinopathy.

Evidence Update

No new studies investigated the effectiveness of orthoses, and therefore, the recommendation is unchanged. It should be noted that for this CPG, foot orthoses are defined as off the shelf or custom (ie, fitted) shoe inserts that support the feet, influence motion of the foot, and alter the interface between the plantar surface of the foot and the shoe.

Gaps in Knowledge

It should be noted that for this CPG, foot orthoses are defined as off-the-shelf or custom (ie, fitted) shoe inserts that support the feet, influence motion of the foot, and alter the interface between the plantar surface of the foot and the shoe. There are many gaps in understanding how orthoses affect Achilles tendinopathy, such as comparing different types of orthoses and their combination with exercise. New theories on how and why orthoses work is needed to spark interest in new orthotic approaches that could benefit individuals with Achilles tendinopathy.

2024 Recommendation

D — Because contradictory evidence exists, no recommendation can be made for the use of orthoses in individuals with midportion Achilles tendinopathy.

TAPING

2018 RECOMMENDATION

F — Clinicians should not use therapeutic elastic tape to reduce pain or improve functional performance in patients with midportion Achilles tendinopathy.

F — Clinicians may use rigid taping to decrease strain on the Achilles tendon and/or alter foot posture in patients with midportion Achilles tendinopathy.

Evidence Update

None.

Gaps in Knowledge

While there is no evidence that directly relates to elastic and rigid taping for midportion Achilles tendinopathy, there is some evidence that taping can be used to offload musculotendinous structures in other body regions.[35]

2024 Recommendation

E — Clinicians may use therapeutic elastic tape to reduce pain or improve functional performance in individuals with midportion Achilles tendinopathy.

E — Clinicians may use rigid taping to decrease strain on the Achilles tendon and/or alter foot posture in individuals with midportion Achilles tendinopathy.

PHYSICAL AGENTS: IONTOPHORESIS

2018 Recommendation

B — Clinicians should use iontophoresis with dexamethasone to decrease pain and improve function in patients with acute midportion Achilles tendinopathy.

Evidence Update

None.

2024 Recommendation
Unchanged.

PHYSICAL AGENTS: LOW-LEVEL LASER THERAPY
2018 Recommendation
D Because contradictory evidence exists, no recommendation can be made for the use of low-level laser therapy in patients with midportion Achilles tendinopathy.

Evidence Update
For this 2024 CPG, low-level laser therapy is operationally defined as a light source treatment that is also called photobiology or biostimulation. The light source is a single wavelength of light, varying from 632 to 904 nm. It emits no heat, sound, or vibration. Theories suggest low-level laser therapy exposure of tendons may influence tendon cells (fibroblasts) accelerating connective tissue repair. An output power of less than 0.5 W is classed as low-level laser therapy (class III in the USA).[37]

II Low-level laser therapies showed no significant effects on function or pain in individuals with midportion Achilles tendinopathy. Martimbianco et al[40] conducted a systematic review of the effects of low-level laser therapy combined with exercise compared to sham laser combined with exercise in individuals with midportion Achilles tendinopathy. Four RCTs (N = 119 participants) were included, all considered low quality. Data were evaluated at short-term (1-3 months) and long-term (13 month) follow-up. Functional assessment using the VISA-A was included using 2 studies at 1 month, 3 months, and 13 months.[40] The only significant difference was7 at 1 month (2 studies [n = 56], −9.19; 95% CI: −16.16, −2.23) favoring the placebo group.[40] The authors concluded that the certainty of evidence to be low to very low, and the results did not support the use of low-level laser therapy for Achilles tendinopathy. A more recent systematic review by Rocha et al[59] included the same RCTs as Martimbianco et al[40] plus 1 additional RCT (n = 5). Similarly, there was no benefit of low-level laser therapy compared to a control treatment on midportion Achilles tendinopathy pain (SMD in pain: 0.28, 95% CI: −0.45, 1.01).

Evidence Synthesis
The systematic review in the evidence update incorporated 3 studies that were not part of the 2018 CPG.[40,59] While there is still minimal evidence suggesting that low-level laser therapy might not benefit individuals with midportion Achilles tendinopathy, the quality of this evidence is low. Additionally, the high heterogeneity among the studies limits the strength of conclusions that can be drawn from meta-analyses. No severe harms of low-level laser therapy were reported.[40] The most common minor adverse events were likely related to exercise, such as muscle soreness.[40]

Gaps in Knowledge
A significant gap is a lack of RCTs of studies with higher dosages of laser therapy. Studies that did not meet the eligibility criteria for the current CPG presented immediate[16] and preliminary findings[39] in participants with Achilles tendinopathy. Therefore, updates to recommendations regarding laser therapy are possible as new, higher quality clinical trials are completed.

2024 Recommendation
C Clinicians should not use low-level laser therapy for individuals with midportion Achilles tendinopathy.

PHYSICAL AGENTS: THERAPEUTIC ULTRASOUND
2018 Recommendation
None.

Evidence Update
I A RCT by Stania et al[65] compared the effectiveness of ESWT (N = 13, Age = 42.0 ± 11.4 years, 15% women), ultrasound therapy (N = 13, Age 36.7 ± 11.6 years, 31% women), and placebo ultrasound (N = 13, Age = 34.0 ± 11.3 years, 62% women) on pain with activity.[65] The ESWT group received one treatment session every 7 days (3 treatment sessions in total) while the ultrasound (frequency 3 MHz; intensity 1.0 W/cm^2; duty cycle 50%) group received treatment five days a week (10 treatment sessions in total). Intensity of pain decreased gradually over 1 to 6 weeks after the intervention in the experimental and placebo groups. The percent reduction in activity-related pain from baseline to 6 weeks was greater in the ESWT group (73.4% ± 25.5%) when compared to the ultrasound (38.7% ± 36.0%). Yet there was no difference in improvement between the ultrasound and placebo (23.7% ± 27.8%) groups.[65]

Evidence Synthesis
Therapeutic ultrasound as a standalone passive treatment is no more effective than a placebo,[65] suggesting it may not offer significant therapeutic benefits for Achilles tendinopathy. Risks of therapeutic ultrasound were not reported in this RCT.[65]

Gaps in Knowledge
There is little evidence available to determine the benefits of therapeutic ultrasound for Achilles tendinopathy.

2024 Recommendation
C Clinicians should not use therapeutic ultrasound alone to treat Achilles tendinopathy.

PHYSICAL AGENTS: OTHER - VIBRATION

2018 Recommendation

None.

Evidence Update

II In a lower level RCT eccentric exercise plus vibration (N = 30, Age = 41.1 ± 9.2 years, 87% women) was compared to eccentric exercise plus cryotherapy (N = 31, Age = 42.1 ± 8.2 years; 84% women) at 4- and 12-week follow-up.[60] Both groups demonstrated a similar level of improvement in function over time (VISA-A at 12 weeks, Exercise plus Vibration = 72.8 ± 10.5, Exercise plus Cryotherapy = 77.7 ± 12.0). No differences were found between groups in VISA-A scores and multifidus thickness. Multifidus cross-sectional area at rest (1094.3 mm^2 ± 171 vs 1173.8 mm^2 ± 192.2) and with contraction (1143.6 mm^2 ± 202.4 vs 1235 mm^2 ± 208.1) were significantly (P = .001; P = .01) greater after the 12 weeks of treatment in the eccentric exercise plus vibration group when compared to eccentric exercise plus cryotherapy.[60]

Evidence Synthesis

The addition of 1 modality versus another (vibration, cryotherapy) to tendon loading exercise for Achilles tendinopathy did not alter functional outcomes.[60] Although these modalities pose minimal risk, they might divert time from treatments with stronger evidence of effectiveness.

Gaps in Knowledge

There is little evidence available to determine the benefits of vibration and/or cryotherapy for Achilles tendinopathy.

MULTIMODAL INTERVENTIONS

2018 Recommendation

None.

Evidence Update

In this 2024 CPG, a multimodal intervention is defined as a therapeutic approach that combines multiple treatments. The design of the RCTs in this section does not permit the determination of the effects of each treatment individually.

II Arora et al[5] completed a systematic review evaluating physical modalities combined with eccentric exercise. Physical modalities that were combined with exercise included extracorporeal shock wave therapy, low-level laser therapy, orthoses, night splint, augmented soft-tissue mobilization (a specialized treatment that utilizes a handheld instrument to transfer shear stresses and pressure to the soft tissue). Studies were only included if the comparison group involved an eccentric training group. When eight different physical modalities were each combined with eccentric exercise, there were no greater benefits for function (VISA-A: short-term pooled SMD, 0.03; 95% CI: 0.46, 0.53; long-term pooled SMD, 0.43; 95% CI: −0.05, 0.92) or pain (numeric pain rating scale: short-term pooled SMD, −0.16; 95% CI: −0.72, 0.40; long-term pooled SMD, −0.46; 95% CI: −1.08, 0.15).[5]

II van der Vlist et al[70] reported the outcome of a network meta-analysis for a range of treatments and treatment combinations for midportion Achilles tendinopathy. A total of 29 RCTs with 65 treatment arms, of which 40 included exercises. The data at 3 months supported exercise combined with another treatment (rank 2 = exercise + ESWT, rank 3 = exercise + mucopolysaccharides, rank 4 = exercise + injections, rank 8 = exercise + placebo injection) compared to a rank of 7 for exercise alone.[70] At 12 months, the data supported exercise combined with another treatments (rank 2 = exercise + injection OR exercise + night splint) compared to exercise alone (rank 4).[70] A caution for interpreting the ranks is that there were no statistical differences between most treatment categories. Challoumas et al[10] completed a systematic review and network meta-analysis comparing the effectiveness of exercise interventions with or without adjunct treatments to other treatments or no treatments (31 RCTs, N = 1792 individuals, mean age = 46 years). Similarly, exercise plus adjunct treatments (injections, low-level laser therapy, orthoses) were all ranked higher than eccentric exercise alone on improvements in the VISA-A at short-term follow-up.[10] At long-term follow-up, exercise plus an injection (prolotherapy, high-volume injection with corticosteroid, platelet rich plasma) were also ranked higher than eccentric exercise alone.[10]

Evidence Synthesis

The new systematic reviews and network meta-analyses include a wide variety of treatments and comparisons; therefore, it is difficult to assess an optimal set of treatments. However, eccentric exercise alone was ranked in the bottom half of treatments based on effect sizes of existing studies, suggesting that although exercise is a first line treatment with positive outcomes, combining exercise with a variety of other treatments may have greater effectiveness.[10,70] In contrast, a systematic review that did not include injections found no additional benefit from using modalities. There was considerable uncertainty around the ranks and analysis because of limited available data (small samples and few studies) and risk of bias among included studies. Therefore, the meta-analyses caution that findings should be interpreted as having a low strength of evidence.[10,70]

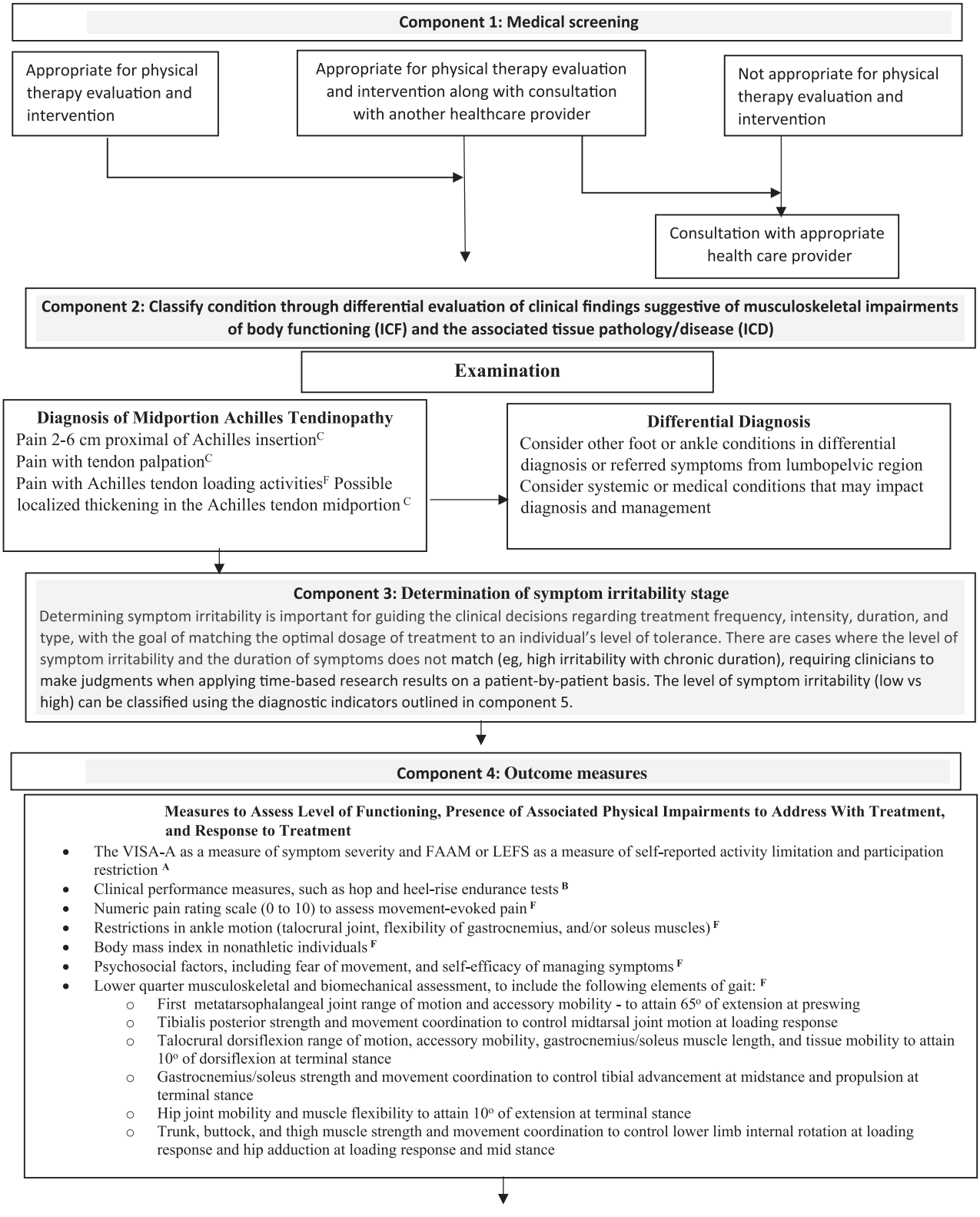
Gaps in Knowledge

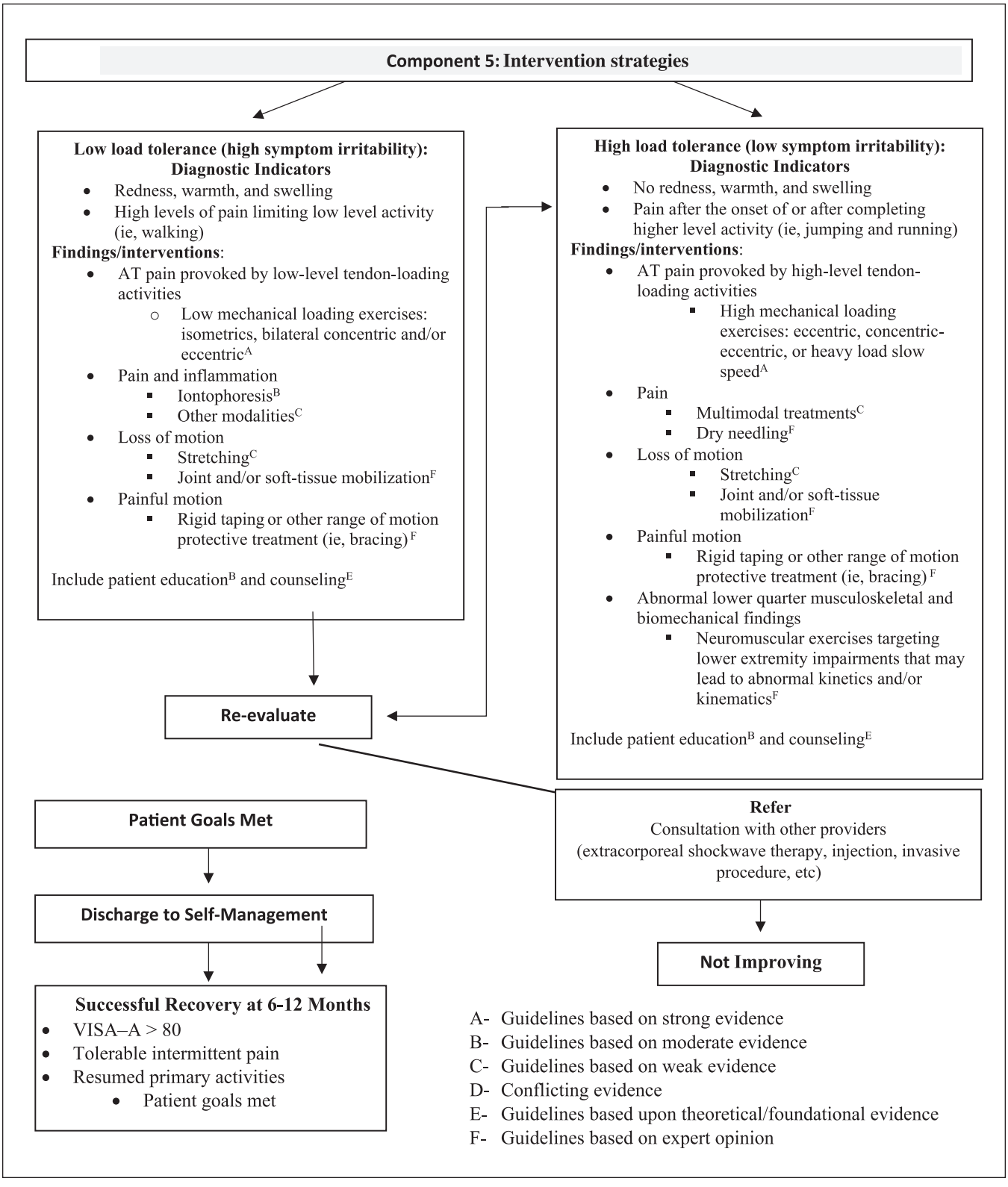
There is a need for more high-quality RCTs that assess specific combinations of treatments.

2024 Recommendation

C Clinicians may include multimodal treatment, including a variety of interventions, to enhance the benefits of exercise for those with midportion Achilles tendinopathy.

DECISION TREE





AFFILIATIONS AND CONTACTS

AUTHORS

Ruth L. Chimenti, PT, PhD
Department of Physical Therapy & Rehabilitation Science
University of Iowa
Iowa City, IA
ruth-chimenti@uiowa.edu

Christopher Neville, PT, PhD
Office of Industry Research and Innovation & Professor
Upstate Medical University
Syracuse, NY
nevillec@upstate.edu

Jeff Houck, PT, PHD
University of Rochester
Rochester, NY
Jeff_Houck@URMC.Rochester.edu

Tyler Cuddeford, PT, PhD
Cuddies & Co.
Newberg, OR
tyler.cuddeford@gmail.com

Dominic Carreira, MD
Peachtree Orthopedics
Atlanta, GA
and
Department of Orthopedics
Atlanta Medical Center
Atlanta, GA
dcarreira@gmail.com

Robroy L. Martin, PT PhD, CSCS
Department of Physical Therapy
Duquesne University
Pittsburgh, PA
and
Center for Sports Medicine
University of Pittsburgh Medical Center
Pittsburgh, PA
and
Academy of Orthopaedic Physical Therapy, APTA, Inc.
La Crosse, WI
martinr280@duq.edu

REVIEWERS

Christopher Carcia, PT, PhD
Professor
Physical Therapy Program Director
Board Certified in Orthopedic and Sports Physical Therapy
Department of Kinesiology
Colorado Mesa University
Grand Junction, CO
ccarcia@coloradomesa.edu

Christopher Gnip, PT, DPT, OCS
Clinical Manager of Outpatient Education – Select Medical
Board-Certified Clinical Specialist in Orthopaedic Physical Therapy
cgnip@selectmedical.com

Karin Grävare Silbernagel, PT, ATC, PhD, FAPTA
Professor and Associate Chair
Department of Physical Therapy
and
Director, Center for Human Research Coordination
University of Delaware
Newark, DE
kgs@udel.edu

Steve Paulseth, PT, DPT, SCS, ATC
Board-Certified Clinical Specialist
Sports Physical Therapy
Paulseth & Associates
Physical Therapy, Inc
Los Angeles, CA
Paulsethpt@yahoo.com

Joseph J. Godges, DPT, MA
Coordinator
CPG Knowledge Translation
Academy of Orthopaedic Physical Therapy, APTA, Inc
La Crosse, WI
and
Adjunct Associate Professor of Clinical Physical Therapy
Division of Biokinesiology and Physical Therapy
Ostrow School of Dentistry
University of Southern California
Los Angeles, CA
godges@pt.usc.edu

GUIDELINES EDITOR

Barbara Hoogenboom, PT, EdD, Emeritus, AT-Ret.
Board-Certified Clinical Specialist Sports Physical Therapy (Emeritus)
Professor and Associate Chair
Physical Therapy Department
Grand Valley State University
Grand Rapids, MI
hoogenbb@gvsu.edu

ACKNOWLEDGMENTS: *The authors would like to acknowledge the contributions of the University of North Carolina Research Librarian, Rebecca Carlson for her assistance with adapting the search design and conducting the literature search. The authors also greatly appreciate all of the reviewers who contributed to the interpretation of the data for the work and revising it critically for important intellectual content.*

These recommendations and clinical practice guidelines are based on the scientific literature published before March 2024.

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APPENDIX A

SEARCH STRATEGIES AND RESULTS

Total Search Results (Includes Duplicates): 934
Total Citations Screened (Duplicates Removed): 571
Database Searches Run October 19, 2022
  Total Results From Searches: 821
  Results After Removing Duplicate Citations: 442
Database Searches Updated March 7, 2024
  Total Results From Searches: 934
  Results After Removing Duplicate Citations: 129

PubMed via NLM – Run 03/07/2024

Search	Concept	Terms	Results
#1	Achilles Tendinopathy	(("Achilles Tendon"[Mesh] OR "calcaneal tendon"[tw] OR achilles[tw]) AND ("Tendinopathy"[Mesh] OR tendinopathy[tw] OR tendinopathies[tw] OR tendinitis[tw] OR tendinitides[tw] OR tendinosis[tw] OR tendinoses[tw])) OR ("tendinitis of the heel"[tw] OR "achilles tendinitis"[tw] OR "achilles tendinopathy"[tw] OR "achilles tendinosis"[tw])	3193
#2	Exercise	"Exercise Therapy"[Mesh] OR "Resistance Training"[Mesh] OR Exercise[tw] OR Exercises[tw] OR Kinesiotherapy[tw] OR Resistance[tw] OR "Strength Training"[tw] OR Strengthening[tw] OR Mobilization[tw] OR Mobilizations[tw] OR Joint Exercise[tw] OR Joint Exercises[tw] OR Rehabilitation[tw] OR Habilitation[tw] OR Isometric[tw] OR Isometrics[tw] OR "Tendon Loading"[tw] OR "Press and Hold"[tw] OR Isotonic[tw] OR Eccentric[tw] OR "Calf Strengthening"[tw] OR Squats[tw] OR "Heel Lowering"[tw] OR "Heel Raising"[tw] OR "Heel Rise"[tw] OR Concentric[tw] OR Isokinetic[tw] OR Isokinetics[tw] OR "Repetitive Motion"[tw]	2 044 717
#3	Laser Therapy	"Laser Therapy"[Mesh:NoExp] OR "laser therapy"[tw] OR "laser therapies"[tw] OR "laser treatment"[tw] OR "laser treatments"[tw] OR Thermomagnetic[tw] OR Electromagnetic[tw]	113 221
#4	Iontopheresis	"Iontophoresis"[Mesh] OR Iontophoresis[tw] OR Iontophoreses[tw] OR Analgesia[tw] OR Analgesic[tw]OR Analgesics[tw]	243 535
#5	Stretching	"Muscle Stretching Exercises"[Mesh] OR "stretching"[tw] OR "Strength Training"[tw] OR "Soft-Tissue Therapy"[tw] OR "Spray and stretch"[tw] OR "strengthen"[tw] OR "strengthens"[tw] OR "strengthening"[tw] OR stretch[tw] OR stretches[tw] OR stretching[tw] OR "Flexibility Training"[tw] OR "Flexibility Exercise"[tw] OR "Flexibility Exercises"[tw]	191 006
#6	Foot Orthoses. Heel Lifts, Footwear	"Foot Orthoses"[Mesh] OR "Orthotic Devices"[Mesh] OR orthotics[tw] OR "foot orthosis"[tw] OR "foot orthoses"[tw] OR "foot orthotic"[tw] OR "arch supports"[tw] OR "arch support"[tw] OR "orthotic shoe"[tw] OR "orthotic shoes"[tw] OR "orthotic footwear"[tw] OR "orthotic insoles"[tw] OR "orthotic insole"[tw] OR "heel lifts"[tw] OR "heel lift"[tw] OR "shoe inserts"[tw] OR "shoe insert"[tw] OR "shoe lifts"[tw] OR "shoe lift"[tw]	19 063
#7	Manual Therapy	"Therapy, Soft Tissue"[Mesh] OR "Massage"[Mesh] OR "Cupping Therapy"[Mesh] OR "Manual Therapy"[tw] OR "Manual Therapies"[tw] OR "Manual Therapeutic"[tw] OR "Joint Mobilization"[tw] OR "Joint Mobilisation"[tw] OR "Soft Tissue Therapy"[tw] OR "Soft Tissue Therapies"[tw] OR "Soft Tissue Mobilization"[tw] OR "Soft Tissue Mobilisation"[tw] OR "Instrument-Assisted Mobilization"[tw] OR "Instrument-Assisted Mobilisation"[tw] OR "Soft-Tissue Therapy"[tw] OR "Graston"[tw] OR Massage[tw] OR "Zone Therapy"[tw] OR "Zone Therapies"[tw] OR Cupping[tw] OR ASTYM[tiab]	25 348
#8	Taping	"Athletic Tape"[Mesh] OR "athletic tape"[tw] OR "orthotic tape"[tw] OR "kinesiology tape"[tw] OR "kinesio tape"[tw] OR "therapeutic tape"[tw] OR Kinesiotape[tw] OR "Adhesive tape"[tw] OR taping[tw]	4117
#9	Night splint	"Splints"[Mesh] OR splint[tw] OR splints[tw] OR splinting[tw] OR splintings[tw] OR "external fixation"[tw] OR "external fixator"[tw] OR "orthopedic fixation"[tw]	35 150
#10	Education	"Pain Management"[Mesh] OR "Pain Measurement"[Mesh] OR "Patient Education as Topic"[Mesh] OR "Pain Management"[tw] OR "Managing Pain"[tw] OR "Pain Science"[tw] OR "Pain Measurement"[tw] OR "Load Management"[tw] OR "Patient Education"[tw] OR "Educating Patients"[tw] OR "Patient Counseling"[tw] OR "Counseling Patients"[tw]	267 117
#11	Ultrasound	"Ultrasonic Therapy"[Mesh:NoExp] OR "Ultrasonic Therapy"[tw] OR "Ultrasonic Therapies"[tw] OR "Shockwave Therapy"[tw] OR "Shockwave Therapies"[tw] OR "Shock Wave Therapy"[tw] OR "Shock Wave Therapies"[tw] OR "Ultrasound Therapy"[tw] OR "Ultrasound Therapies"[tw] OR "Therapeutic Ultrasound"[tw] OR "HIFU Therapy"[tw] OR "HIFU Therapies"[tw] OR "Continuous Ultrasound"[tw] OR "Pulsed Ultrasound"[tw]	16 316

Table continues on next page.

APPENDIX A (CONTINUED)

Search	Concept	Terms	Results
#12	Therapeutic Modalities	"Combined Modality Therapy"[Mesh:NoExp] OR "Physical Therapy Modalities"[mesh] OR Rehabilitation[Mesh:-NoExp] OR Diathermy[Mesh] OR "Electric Stimulation"[Mesh] OR "Electric Stimulation Therapy"[Mesh] OR "Transcutaneous Electric Nerve Stimulation"[Mesh] OR "Cryotherapy"[Mesh] OR diathermy[tw] OR cryotherapy[tw] OR cryotherapies[tw] OR "cold therapy"[tw] OR "cold therapies"[tw] OR "therapeutic cold"[tw] OR "cryo-cuff"[tw] OR "cryo cuff"[tw] OR thermotherapeutic[tw] OR thermotherapy[tw] OR thermotherapies[tw] OR "thermo therapy"[tw] OR "thermo therapies"[tw] OR "thermal modality"[tw] OR "thermal modalities"[tw] OR "thermal therapy"[tw] OR "thermal therapies"[tw] OR "thermal agent"[tw] OR "thermal agents"[tw] OR "moist heat"[tw] OR "moist heating"[tw] OR "heat therapy"[tw] OR "heat therapies"[tw] OR "therapeutic heat"[tw] OR "ice therapy"[tw] OR "ice therapies"[tw] OR "therapeutic ice"[tw] OR "therapeutic icing"[tw] OR "diathermy"[-tiab] OR "muscle stimulation"[tiab] OR "neuromuscular stimulation"[tiab] OR "electric muscle stimulation"[-tiab] OR "neuromuscular electrical stimulation"[tiab] OR "transcutaneous electrical nerve stimulation"[tiab] OR "electrostimulation"[tw] OR "electric stimulation"[tw] OR "nerve stimulation"[tw] OR electrotherapy[tw] OR electrotherapies[tw] OR "electrical therapy"[tw] OR "electrical therapies"[tw] OR "therapeutic modalities"[tw] OR "physical agents"[tw] OR "physical modalities"[tw] OR "physical interventions"[tw] OR "Physical therapeutic*"[tw] OR "Physical therapy"[tw] OR "Physical therapies"[tw] OR Physiotherapy[tw] OR Physiotherapies[tw] OR Physiotherapeutic[tw] OR "Physical Therapist"[tw] OR "Physical Therapists"[tw]	679 962
#13	Dry Needling	"Dry needle"[tiab] OR "Dry needles"[tiab] OR "Dry needling"[tiab]	1023
#14	All Interventions	#2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13	3 224 458
#15	Combined Search Terms	#1 AND #14	1221
#16	Combined with Search Filters	#15 AND "English"[Language] AND ("2017"[Date - Publication] : "3000"[Date - Publication]) NOT (Animals[Mesh] NOT Humans[Mesh])	527
#17	Combined with Publication Type Filters	#16 AND (clinical trials as topic[Mesh] OR clinical trial[pt] OR randomized controlled trial[pt] OR controlled clinical trial[pt] OR random*[tiab] OR placebo[tiab] OR trial[tiab] OR groups[tiab] OR meta analysis[Publication Type] OR systematic review[Publication Type] OR "systematic review"[ti] OR "meta-analysis"[ti] OR "meta analysis"[-ti] OR "meta-synthesis"[ti] OR "meta synthesis"[ti])	250

Cochrane Library via Wiley – Run 03/07/2024

Search	Concept	Terms	Results
#1	Achilles Tendinopathy	(([mh "Achilles Tendon"] OR "calcaneal tendon":ti,ab,kw OR achilles:ti,ab,kw) AND ([mh Tendinopathy] OR tendinopathy:ti,ab,kw OR tendinopathies:ti,ab,kw OR tendinitis:ti,ab,kw OR tendinitides:ti,ab,kw OR tendinosis:ti,ab,kw OR tendinoses:ti,ab,kw)) OR ("tendinitis of the heel":ti,ab,kw OR "achilles tendinitis":ti,ab,kw OR "achilles tendinopathy":ti,ab,kw OR "achilles tendinosis":ti,ab,kw)	466
#2	Exercise	[mh "Exercise Therapy"] OR [mh "Resistance Training"] OR Exercise:ti,ab,kw OR Exercises:ti,ab,kw OR Kinesiotherapy:ti,ab,kw OR Resistance:ti,ab,kw OR "Strength Training":ti,ab,kw OR Strengthening:ti,ab,kw OR Mobilization:ti,ab,kw OR Mobilizations:ti,ab,kw OR "Joint Exercise":ti,ab,kw OR "Joint Exercises":ti,ab,kw OR Rehabilitation:ti,ab,kw OR Habilitation:ti,ab,kw OR Isometric:ti,ab,kw OR Isometrics:ti,ab,kw OR "Tendon Loading":ti,ab,kw OR "Press and Hold":ti,ab,kw OR Isotonic:ti,ab,kw OR Eccentric:ti,ab,kw OR "Calf Strengthening":ti,ab,kw OR Squats:ti,ab,kw OR "Heel Lowering":ti,ab,kw OR "Heel Raising":ti,ab,kw OR "Heel Rise":ti,ab,kw OR Concentric:ti,ab,kw OR Isokinetic:ti,ab,kw OR Isokinetics:ti,ab,kw OR "Repetitive Motion":ti,ab,kw	257 976
#3	Laser Therapy	[mh ^"Laser Therapy"] OR "laser therapy":ti,ab,kw OR "laser therapies":ti,ab,kw OR "laser treatment":ti,ab,kw OR "laser treatments":ti,ab,kw OR Thermomagnetic:ti,ab,kw OR Electromagnetic:ti,ab,kw	10 781
#4	Iontopheresis	[mh Iontophoresis] OR Iontophoresis:ti,ab,kw OR Iontophoreses:ti,ab,kw OR Analgesia:ti,ab,kw OR Analgesics:ti,ab,kw OR Analgesics:ti,ab,kw	69 719
#5	Stretching	[mh "Muscle Stretching Exercises"] OR stretching:ti,ab,kw OR "Strength Training":ti,ab,kw OR "Soft-Tissue Therapy":ti,ab,kw OR "Spray and stretch":ti,ab,kw OR strengthen:ti,ab,kw OR strengthens:ti,ab,kw OR strengthening:ti,ab,kw OR stretch:ti,ab,kw OR stretches:ti,ab,kw OR stretching:ti,ab,kw OR "Flexibility Training":ti,ab,kw OR "Flexibility Exercise":ti,ab,kw OR "Flexibility Exercises":ti,ab,kw	24 849
#6	Foot Orthoses. Heel Lifts, Footwear	[mh "Foot Orthoses"] OR [mh "Orthotic Devices"] OR orthotics:ti,ab,kw OR "foot orthosis":ti,ab,kw OR "foot orthoses":ti,ab,kw OR "foot orthotic":ti,ab,kw OR "arch supports":ti,ab,kw OR "arch support":ti,ab,kw OR "orthotic shoe":ti,ab,kw OR "orthotic shoes":ti,ab,kw OR "orthotic footwear":ti,ab,kw OR "orthotic insoles":ti,ab,kw OR "orthotic insole":ti,ab,kw OR "heel lifts":ti,ab,kw OR "heel lift":ti,ab,kw OR "shoe inserts":ti,ab,kw OR "shoe insert":ti,ab,kw OR "shoe lifts":ti,ab,kw OR "shoe lift":ti,ab,kw	3327
#7	Manual Therapy	[mh "Therapy, Soft Tissue"] OR [mh Massage] OR [mh "Cupping Therapy"] OR "Manual Therapy":ti,ab,kw OR "Manual Therapies":ti,ab,kw OR "Manual Therapeutic":ti,ab,kw OR "Joint Mobilization":ti,ab,kw OR "Joint Mobilisation":ti,ab,kw OR "Soft Tissue Therapy":ti,ab,kw OR "Soft Tissue Therapies":ti,ab,kw OR "Soft Tissue Mobilization":ti,ab,kw OR "Soft Tissue Mobilisation":ti,ab,kw OR "Instrument-Assisted Mobilization":ti,ab,kw OR "Instrument-Assisted Mobilisation":ti,ab,kw OR "Soft-Tissue Therapy":ti,ab,kw OR Graston:ti,ab,kw OR Massage:ti,ab,kw OR "Zone Therapy":ti,ab,kw OR "Zone Therapies":ti,ab,kw OR Cupping:ti,ab,kw OR ASTYM:ti,ab	12 107

Table continues on next page.

APPENDIX A (CONTINUED)

Search	Concept	Terms	Results
#8	Taping	[mh "Athletic Tape"] OR "athletic tape":ti,ab,kw OR "orthotic tape":ti,ab,kw OR "kinesiology tape":ti,ab,kw OR "kinesio tape":ti,ab,kw OR "therapeutic tape":ti,ab,kw OR Kinesiotape:ti,ab,kw OR "Adhesive tape":ti,ab,kw OR taping:ti,ab,kw	2671
#9	Night splint	[mh Splints] OR splint:ti,ab,kw OR splints:ti,ab,kw OR splinting:ti,ab,kw OR splintings:ti,ab,kw OR "external fixation":ti,ab,kw OR "external fixator":ti,ab,kw OR "orthopedic fixation":ti,ab,kw	3970
#10	Education	[mh "Pain Management"] OR [mh "Pain Measurement"] OR [mh "Patient Education as Topic"] OR "Pain Management":ti,ab,kw OR "Managing Pain":ti,ab,kw OR "Pain Science":ti,ab,kw OR "Pain Measurement":ti,ab,kw OR "Load Management":ti,ab,kw OR "Patient Education":ti,ab,kw OR "Educating Patients":ti,ab,kw OR "Patient Counseling":ti,ab,kw OR "Counseling Patients":ti,ab,kw	57 952
#11	Ultrasound	[mh ^"Ultrasonic Therapy"] OR "Ultrasonic Therapy":ti,ab,kw OR "Ultrasonic Therapies":ti,ab,kw OR "Shockwave Therapy":ti,ab,kw OR "Shockwave Therapies":ti,ab,kw OR "Shock Wave Therapy":ti,ab,kw OR "Shock Wave Therapies":ti,ab,kw OR "Ultrasound Therapy":ti,ab,kw OR "Ultrasound Therapies":ti,ab,kw OR "Therapeutic Ultrasound":ti,ab,kw OR "HIFU Therapy":ti,ab,kw OR "HIFU Therapies":ti,ab,kw OR "Continuous Ultrasound":ti,ab,kw OR "Pulsed Ultrasound":ti,ab,kw	3801
#12	Therapeutic Modalities	[mh ^"Combined Modality Therapy"] OR [mh "Physical Therapy Modalities"] OR [mh ^Rehabilitation] OR [mh Diathermy] OR [mh "Electric Stimulation"] OR [mh "Electric Stimulation Therapy"] OR [mh "Transcutaneous Electric Nerve Stimulation"] OR [mh Cryotherapy] OR diathermy:ti,ab,kw OR cryotherapy:ti,ab,kw OR cryotherapies:ti,ab,kw OR "cold therapy":ti,ab,kw OR "cold therapies":ti,ab,kw OR "therapeutic cold":ti,ab,kw OR cryo-cuff:ti,ab,kw OR "cryo cuff":ti,ab,kw OR thermotherapeutic:ti,ab,kw OR thermotherapy:ti,ab,kw OR thermotherapies:ti,ab,kw OR "thermo therapy":ti,ab,kw OR "thermo therapies":ti,ab,kw OR "thermal modality":ti,ab,kw OR "thermal modalities":ti,ab,kw OR "thermal therapy":ti,ab,kw OR "thermal therapies":ti,ab,kw OR "thermal agent":ti,ab,kw OR "thermal agents":ti,ab,kw OR "moist heat":ti,ab,kw OR "moist heating":ti,ab,kw OR "heat therapy":ti,ab,kw OR "heat therapies":ti,ab,kw OR "therapeutic heat":ti,ab,kw OR "ice therapy":ti,ab,kw OR "ice therapies":ti,ab,kw OR "therapeutic ice":ti,ab,kw OR "therapeutic icing":ti,ab,kw OR diathermy:ti,ab OR "muscle stimulation":ti,ab OR "neuromuscular stimulation":ti,ab OR "electric muscle stimulation":ti,ab OR "neuromuscular electrical stimulation":ti,ab OR "transcutaneous electrical nerve stimulation":ti,ab OR electrostimulation:ti,ab,kw OR "electric stimulation":ti,ab,kw OR "nerve stimulation":ti,ab,kw OR electrotherapy:ti,ab,kw OR electrotherapies:ti,ab,kw OR "electrical therapy":ti,ab,kw OR "electrical therapies":ti,ab,kw OR "therapeutic modalities":ti,ab,kw OR "physical agents":ti,ab,kw OR "physical modalities":ti,ab,kw OR "physical interventions":ti,ab,kw OR ("Physical" NEXT therapeutic*):ti,ab,kw OR "Physical therapy":ti,ab,kw OR "Physical therapies":ti,ab,kw OR Physiotherapy:ti,ab,kw OR Physiotherapies:ti,ab,kw OR Physiotherapeutic:ti,ab,kw OR "Physical Therapist":ti,ab,kw OR "Physical Therapists":ti,ab,kw	98 766
#13	Dry Needling	"Dry needle":ti,ab OR "Dry needles":ti,ab OR "Dry needling":ti,ab	1143
#14	All Interventions	#2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13	421 435
#15	Combined Search Terms	#1 AND #14	426
#16	Combined with Search Filters	#15 AND Cochrane Library Publication Date: January 2017 - Present	314

CINAHL Plus via EBSCO – Run 03/07/2024

Search	Concept	Terms	Results
#1	Achilles Tendinopathy	(((MH "Achilles Tendon+") OR "calcaneal tendon" OR achilles) AND (tendinopathy OR tendinopathies OR tendinitis OR tendinitides OR tendinosis OR tendinoses)) OR ((MH "Achilles Tendinopathy+") OR "tendinitis of the heel" OR "achilles tendinitis" OR "achilles tendinopathy" OR "achilles tendinosis")	1929
#2	Exercise	(MH "Therapeutic Exercise+") OR (MH "Resistance Training+") OR Exercise OR Exercises OR Kinesiotherapy OR Resistance OR "Strength Training" OR Strengthening OR Mobilization OR Mobilizations OR "Joint Exercise" OR "Joint Exercises" OR Rehabilitation OR Habilitation OR Isometric OR Isometrics OR "Tendon Loading" OR "Press and Hold" OR Isotonic OR Eccentric OR "Calf Strengthening" OR Squats OR "Heel Lowering" OR "Heel Raising" OR "Heel Rise" OR Concentric OR Isokinetic OR Isokinetics OR "Repetitive Motion"	559 684
#3	Laser Therapy	(MH "Laser Therapy") OR "laser therapy" OR "laser therapies" OR "laser treatment" OR "laser treatments" OR Thermomagnetic OR Electromagnetic	18 733
#4	Iontopheresis	(MH Iontophoresis+) OR Iontophoresis OR Iontophoreses OR Analgesia OR Analgesic OR Analgesics	80 363
#5	Stretching	(MH "Stretchings+") OR stretching OR "Strength Training" OR "Soft-Tissue Therapy" OR "Spray and stretch" OR strengthen OR strengthens OR strengthening OR stretch OR stretches OR stretching OR "Flexibility Training" OR "Flexibility Exercise" OR "Flexibility Exercises"	65 465
#6	Foot Orthoses. Heel Lifts, Footwear	(MH "Foot Orthoses+") OR orthotics OR orthoses OR "foot orthosis" OR "foot orthoses" OR "foot orthotic" OR "arch supports" OR "arch support" OR "orthotic shoe" OR "orthotic shoes" OR "orthotic footwear" OR "orthotic insoles" OR "orthotic insole" OR "heel lifts" OR "heel lift" OR "shoe inserts" OR "shoe insert" OR "shoe lifts" OR "shoe lift"	12 356

Table continues on next page.

APPENDIX A (CONTINUED)

Search	Concept	Terms	Results
#7	Manual Therapy	(MH Massage+) OR (MH "Cupping Therapy+") OR "Manual Therapy" OR "Manual Therapies" OR "Manual Therapeutic" OR "Joint Mobilization" OR "Joint Mobilisation" OR "Soft Tissue Therapy" OR "Soft Tissue Therapies" OR "Soft Tissue Mobilization" OR "Soft Tissue Mobilisation" OR "Instrument-Assisted Mobilization" OR "Instrument-Assisted Mobilisation" OR "Soft-Tissue Therapy" OR Graston OR Massage OR "Zone Therapy" OR "Zone Therapies" OR Cupping OR (TI ASTYM OR AB ASTYM)	32 178
#8	Taping	(MH "Athletic Tape+") OR "athletic tape" OR "orthotic tape" OR "kinesiology tape" OR "kinesio tape" OR "therapeutic tape" OR Kinesiotape OR "Adhesive tape" OR taping	3182
#9	Night splint	(MH Splints+) OR splint OR splints OR splinting OR splintings OR "external fixation" OR "external fixator" OR "orthopedic fixation"	25 185
#10	Education	(MH "Pain Management+") OR (MH "Pain Measurement+") OR (MH "Patient Education+") OR "Pain Management" OR "Managing Pain" OR "Pain Science" OR "Pain Measurement" OR "Load Management" OR "Patient Education" OR "Educating Patients" OR "Patient Counseling" OR "Counseling Patients"	174 189
#11	Ultrasound	(MH "Ultrasonic Therapy") OR "Ultrasonic Therapy" OR "Ultrasonic Therapies" OR "Shockwave Therapy" OR "Shockwave Therapies" OR "Shock Wave Therapy" OR "Shock Wave Therapies" OR "Ultrasound Therapy" OR "Ultrasound Therapies" OR "Therapeutic Ultrasound" OR "HIFU Therapy" OR "HIFU Therapies" OR "Continuous Ultrasound" OR "Pulsed Ultrasound"	4431
#12	Therapeutic Modalities	(MH "Combined Modality Therapy") OR (MH "Physical Therapy+") OR (MH Rehabilitation) OR (MH Diathermy+) OR (MH "Electric Stimulation+") OR (MH "Transcutaneous Electric Nerve Stimulation+") OR (MH Cryotherapy+) OR diathermy OR cryotherapy OR cryotherapies OR "cold therapy" OR "cold therapies" OR "therapeutic cold" OR cryo-cuff OR "cryo cuff" OR thermotherapeutic OR thermotherapy OR thermotherapies OR "thermo therapy" OR "thermo therapies" OR "thermal modality" OR "thermal modalities" OR "thermal therapy" OR "thermal therapies" OR "thermal agent" OR "thermal agents" OR "moist heat" OR "moist heating" OR "heat therapy" OR "heat therapies" OR "therapeutic heat" OR "ice therapy" OR "ice therapies" OR "therapeutic ice" OR "therapeutic icing" OR (TI diathermy OR AB diathermy) OR (TI "muscle stimulation" OR AB "muscle stimulation") OR (TI "neuromuscular stimulation" OR AB "neuromuscular stimulation") OR (TI "electric muscle stimulation" OR AB "electric muscle stimulation") OR (TI "neuromuscular electrical stimulation" OR AB "neuromuscular electrical stimulation") OR (TI "transcutaneous electrical nerve stimulation" OR AB "transcutaneous electrical nerve stimulation") OR electrostimulation OR "electric stimulation" OR "nerve stimulation" OR electrotherapy OR electrotherapies OR "electrical therapy" OR "electrical therapies" OR "therapeutic modalities" OR "physical agents" OR "physical modalities" OR "physical interventions" OR "Physical therapeutic*" OR "Physical therapy" OR "Physical therapies" OR Physiotherapy OR Physiotherapies OR Physiotherapeutic OR "Physical Therapist" OR "Physical Therapists"	253 656
#13	Dry Needling	(MH "Dry Needling") OR (TI "Dry needle" OR AB "Dry needle") OR (TI "Dry needles" OR AB "Dry needles") OR (TI "Dry needling" OR AB "Dry needling")	958
#14	All Interventions	S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13	958 285
#15	Combined Search Terms	S1 AND S14	947
#16	Combined with Search Filters	S15 AND Language:English AND Publication Date:2017-2024 AND Publication Type: Clinical Trial, Meta Analysis, Meta Synthesis, Randomized Controlled Trial, Systematic Review	107
#17	Combined with Publication Type Filters	S15 AND Language:English AND Publication Date:2017-2024 AND (TI random* OR AB random*) OR (TI placebo OR AB placebo) OR (TI trial OR AB trial) OR (TI groups OR AB groups) OR (TI controlled OR AB controlled) OR (TI "systematic review" OR AB "systematic review") OR (TI meta-analysis OR AB meta-analysis) OR (TI "meta analysis" OR AB "meta analysis")	170
#18	Combined Filters	S16 OR S17	277

PEDro Physiotherapy Evidence Database – Run 03/07/2024

Search	Terms	Results
#1	Title or Abstract: "achilles tendinitis" AND Published Since: 2017	2
#2	Title or Abstract: "achilles tendinopathy" AND Published Since: 2017	53
#3	Title or Abstract: achilles AND Problem: Pain AND Published Since: 2017	79
#4	Title or Abstract: achilles AND Problem: Reduced Exercise Tolerance AND Published Since: 2017	29
#5	Title or Abstract: achilles AND Therapy: Fitness Training AND Published Since: 2017	3
#6	Title or Abstract: achilles AND Therapy: Strength Training AND Published Since: 2017	48
#7	Title or Abstract: achilles AND Therapy: Stretching, Mobilisation, Manipulation, Massage AND Published Since: 2017	33
#8	Title or Abstract: achilles AND Therapy: Orthoses, Taping, Splinting AND Published Since: 2017	17
#9	Title or Abstract: achilles AND Therapy: Education AND Published Since: 2017	2
#10	Title or Abstract: achilles AND Therapy: Electrotherapies, Heat, Cold AND Published Since: 2017	25
#11	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10	93

APPENDIX B

ARTICLE INCLUSION AND EXCLUSION CRITERIA

I. Article Characteristics:

Include:
- English
- Published from November 2017 to March 2024
- Articles reporting analysis of data: systematic reviews, meta-analyses, randomized controlled trials

Exclude:
- Study protocols
- Abstracts, press report, newsletter, editorial letter
- Articles published in non–peer-reviewed publications (for example theses)
- Experimental and quasi-experimental, cohort, cross-sectional studies, case series, case reports

II. Patient/Subject Characteristics:

Include:
- Studies using data from humans
- Subjects over 16 years of age (if mixed, the mean should be over 16)
- Subjects with Achilles tendinitis, tendinopathy, tendinosis
- If the article reports on Achilles tendinitis along with other conditions there must be at least enough patients (˜n = 15 each group) with Achilles tendinitis AND the results must be reported for Achilles tendinitis separately

Exclude:
- Articles on healthy/normal subjects

III. Topics Included

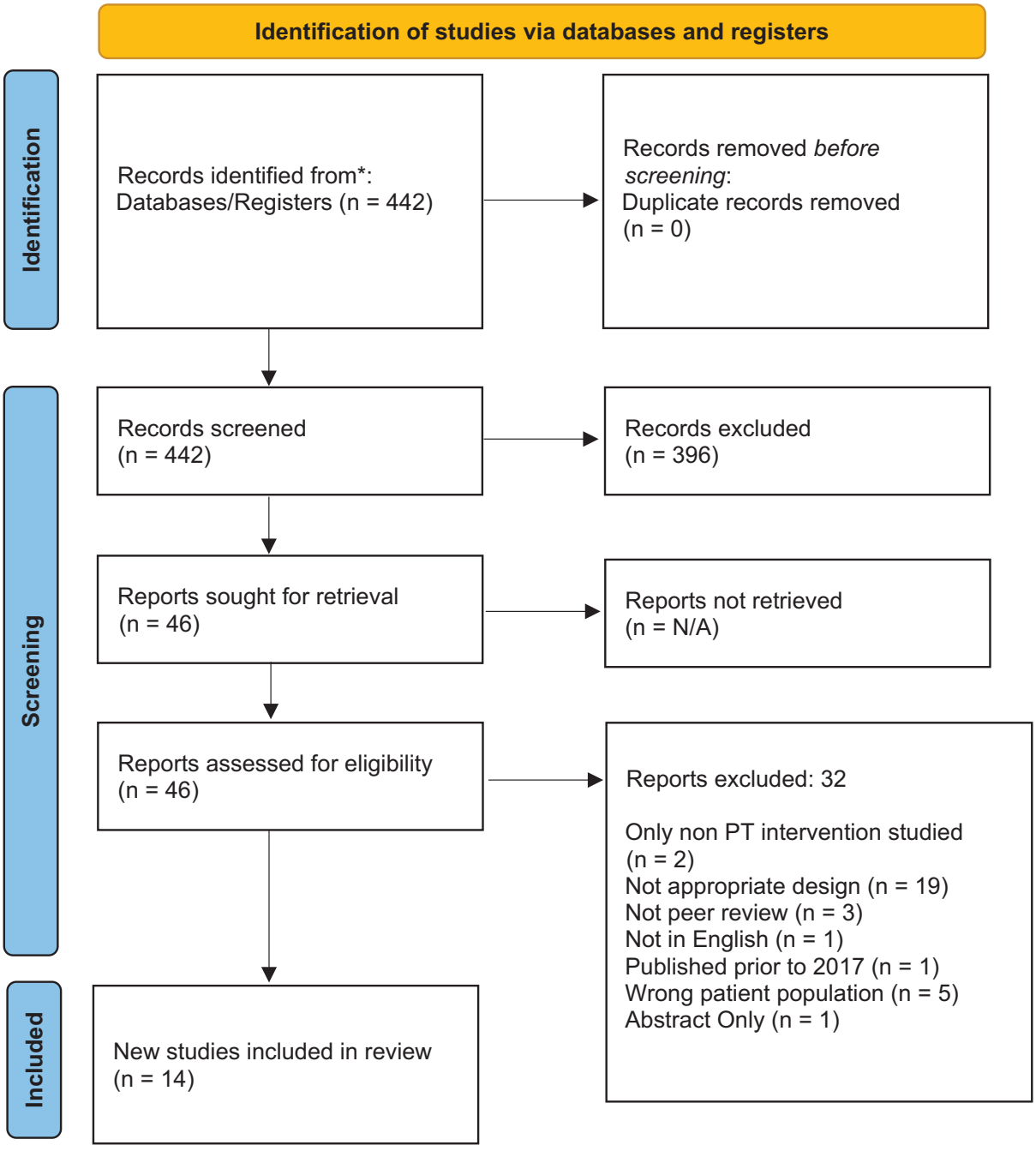
A. For evidence update:
- Prevalence
- Pathoanatomic features: the functional anatomy of the ankle and foot relevant to Achilles tendinitis
- Risk factors
  - Intrinsic – eg, decreased dorsiflexion range of motion, subtalar motion, plantar flexion strength, pronation, and health conditions/comorbidities such as obesity, hypertension, hyperlipidemia, and diabetes
  - Extrinsic – eg, training characteristics, environmental factors, equipment-related factors
- Prognosis
- Imaging studies
- Classification systems including but not limited to Curwin and Stanish, Nirschl Pain Phase Scale of Athletic Overuse Injuries, and Puffer and Zachazewski scale
- Tests and measures for diagnosis of Achilles tendinitis within the scope of physical therapist practice, including but not limited to Positive Achilles Palpation Test, plantar flexion range of motion, Unilateral Heel Rise Test, the Arc Sign, Victorian Institute of Sport Assessment, Foot and Ankle Ability Measure, Royal London Hospital test
- Differential diagnosis including but not limited to acute Achilles rupture, partial Achilles tear, retrocalcaneal bursitis, posterior ankle impingement, sural nerve neuroma or irritation, os trigonium syndrome, accessory soleus, Achilles tendon ossification, systemic inflammatory disease, and insertional Achilles tendinopathy
- Measurement properties of outcome measures relevant for Achilles tendinopathy, including but not limited to measures assessing:
  - Body Structures and Function
    - Truncated Arch Height Ratio
    - Arc Sign
    - Royal London Hospital test
    - Forefoot alignment
    - Achilles tendon palpation test
    - Pain
    - Range of motion (dorsi, plantar, inv, ev)
    - Plantar flexion strength
    - Plantar flexion endurance
  - Activity: eg, the Silbernagel battery
  - Participation

B. For Formal Systematic Review (including critical appraisal and formal recommendations)
- Interventions within the scope of practice of physical therapists, including but not limited to (RCT, SR):
  - Exercise
  - Low-level laser therapy
  - Iontopheresis
  - Stretching
  - Foot orthoses
    - Orthotics, insoles
  - Shoe wear
    - footwear
  - Manual therapy
    - Soft tissue mobilization, Graston, joint mobilization, massage, cupping, ASTYM
  - Taping
  - Heel lifts
  - Night splint
  - Education
    - Patient education
    - Pain science
    - Load management
  - Ultrasound
  - Therapeutic modalities
    - Diathermy
    - Ice
    - Heat
    - Electrical stimulation
    - TENS
  - Dry needling

APPENDIX C

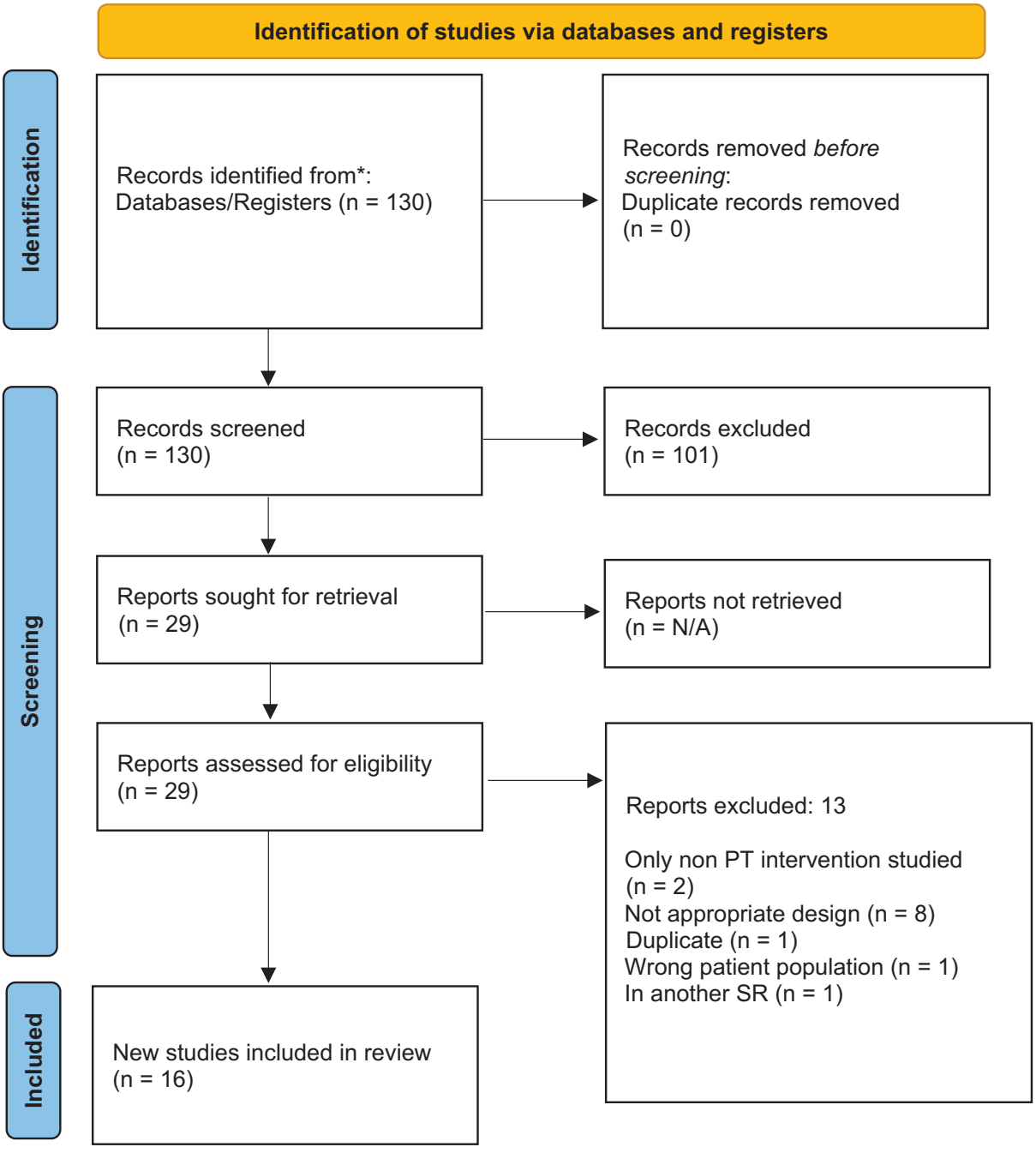
FLOWCHART OF ARTICLES

Achilles Pain – October 2024



APPENDIX C (CONTINUED)

Achilles Pain – March 2024



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).
**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.
From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. https://doi.org/10.1136/bmj.n71
For more information, visit http://www.prisma-statement.org/.

APPENDIX D

LEVELS OF EVIDENCE TABLE[a]

Level	Intervention/Prevention	Pathoanatomic/Risk/Clinical Course/ Prognosis/Differential Diagnosis	Diagnosis/Diagnostic Accuracy	Prevalence of Condition/ Disorder	Exam/Outcomes
I	Systematic review of high-quality RCTs	Systematic review of prospective cohort studies	Systematic review of high-quality diagnostic studies	Systematic review, high-quality cross-sectional studies	Systematic review of prospective cohort studies
	High-quality RCT[b]	High-quality prospective cohort study[c]	High-quality diagnostic study[d] with validation	High-quality cross-sectional study[e]	High-quality prospective cohort study
II	Systematic review of high-quality cohort studies	Systematic review of retrospective cohort study	Systematic review of exploratory diagnostic studies or consecutive cohort studies	Systematic review of studies that allows relevant estimate	Systematic review of lower-quality prospective cohort studies
	High-quality cohort study[c]	Lower-quality prospective cohort study	High-quality exploratory diagnostic studies	Lower-quality cross-sectional study	Lower-quality prospective cohort study
	Outcomes study or ecological study	High-quality retrospective cohort study	Consecutive retrospective cohort		
	Lower-quality RCT¶	Consecutive cohort			
		Outcomes study or ecological study			
III	Systematic reviews of case-control studies	Lower-quality retrospective cohort study	Lower-quality exploratory diagnostic studies	Local nonrandom study	High-quality cross-sectional study
	High-quality case-control study	High-quality cross-sectional study	Nonconsecutive retrospective cohort		
	Lower-quality cohort study	Case-control study			
IV	Case series	Case series	Case-control study		Lower-quality cross-sectional study
V	Expert opinion	Expert opinion	Expert opinion	Expert opinion	Expert opinion

Abbreviation: RCT, randomized clinical trial.

Weaker diagnostic criteria and reference standards, improper randomization, no blinding, and less than 80% follow-up may add bias and threats to validity.

[a]*Adapted from the Center for Evidence-based Medicine 2009 levels of evidence.*[216] *See also* **APPENDIX E.**

[b]*High quality includes RCTs with greater than 80% follow-up, blinding, and appropriate randomization procedures.*

[c]*High-quality cohort study includes greater than 80% follow-up.*

[d]*High-quality diagnostic study includes consistently applied reference standard and blinding.*

[e]*High-quality prevalence study is a cross-sectional study that uses a local and current random sample or censuses*

APPENDIX E

PROCEDURES FOR ASSIGNING LEVELS OF EVIDENCE

- Level of evidence is assigned based on the study design using the Levels of Evidence table (**APPENDIX D**), assuming high quality (eg, for intervention, randomized clinical trial starts at level I)
- Study quality is assessed using the critical appraisal tool, and the study is assigned 1 of 4 overall quality ratings based on the critical appraisal results
- Level of evidence assignment is adjusted based on the overall quality rating:
  - High quality (high confidence in the estimate/results): study remains at assigned level of evidence (eg, if the randomized clinical trial is rated high quality, its final assignment is level I). High quality should include:
    - Randomized clinical trial with greater than 80% follow-up, blinding, and appropriate randomization procedures
    - Cohort study includes greater than 80% follow-up
    - Diagnostic study includes consistently applied reference standard and blinding
    - Prevalence study is a cross-sectional study that uses a local and current random sample or censuses
  - Acceptable quality (the study does not meet requirements for high quality and weaknesses limit the confidence in the accuracy of the estimate): downgrade 1 level
    - Based on critical appraisal results
  - Low quality: the study has significant limitations that substantially limit confidence in the estimate: downgrade 2 levels
    - Based on critical appraisal results
  - Unacceptable quality: serious limitations - exclude from consideration in the guideline
    - Based on critical appraisal results