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This report

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Abstract

Exercise therapy for tendinopathy: a mixed-methods evidence synthesis exploring feasibility, acceptability and effectiveness

Kay Cooper,[1,*] Lyndsay Alexander,[1] David Brandie,[2] Victoria Tzortziou Brown,[3] Leon Greig,[1] Isabelle Harrison,[1] Colin MacLean,[4] Laura Mitchell,[5] Dylan Morrissey,[6] Rachel Ann Moss,[1] Eva Parkinson,[1] Anastasia Vladimirovna Pavlova,[1] Joanna Shim[1] and Paul Alan Swinton[1]

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Background: Tendinopathy is a common, painful and functionally limiting condition, primarily managed conservatively using exercise therapy.

Review questions: (i) What exercise interventions have been reported in the literature for which tendinopathies? (ii) What outcomes have been reported in studies investigating exercise interventions for tendinopathy? (iii) Which exercise interventions are most effective across all tendinopathies? (iv) Does type/location of tendinopathy or other specific covariates affect which are the most effective exercise therapies? (v) How feasible and acceptable are exercise interventions for tendinopathies?

Methods: A scoping review mapped exercise interventions for tendinopathies and outcomes reported to date (questions i and ii). Thereafter, two contingent systematic review workstreams were conducted. The first investigated a large number of studies and was split into three efficacy reviews that quantified and compared efficacy across different interventions (question iii), and investigated the influence of a range of potential moderators (question iv). The second was a convergent segregated mixed-method review (question v). Searches for studies published from 1998 were conducted in library databases (n = 9), trial registries (n = 6), grey literature databases (n = 5) and Google Scholar. Scoping review searches were completed on 28 April 2020 with efficacy and mixed-method search updates conducted on 19 January 2021 and 29 March 2021.

Results: *Scoping review* – 555 included studies identified a range of exercise interventions and outcomes across a range of tendinopathies, most commonly Achilles, patellar, lateral elbow and rotator cuff-related shoulder pain. Strengthening exercise was most common, with flexibility exercise used primarily in the upper limb. Disability was the most common outcome measured in Achilles, patellar and rotator cuff-related shoulder pain; physical function capacity was most common in lateral elbow tendinopathy.

Efficacy reviews – 204 studies provided evidence that exercise therapy is safe and beneficial, and that patients are generally satisfied with treatment outcome and perceive the improvement to be substantial. In the context of generally low and very low-quality evidence, results identified that: (1) the shoulder may benefit more from flexibility (effect size$_{\text{Resistance:Flexibility}}$ = 0.18 [95% CrI 0.07 to 0.29]) and proprioception (effect size$_{\text{Resistance:Proprioception}}$ = 0.16 [95% CrI −1.8 to 0.32]); (2) when performing strengthening exercise it may be most beneficial to combine concentric and eccentric modes (effect size$_{\text{EccentricOnly:Concentric+Eccentric}}$ = 0.48 [95% CrI −0.13 to 1.1]; and (3) exercise may be most beneficial when combined with another conservative modality (e.g. injection or electro-therapy increasing effect size by ≈0.1 to 0.3).

Mixed-method review – 94 studies (11 qualitative) provided evidence that exercise interventions for tendinopathy can largely be considered feasible and acceptable, and that several important factors should be considered when prescribing exercise for tendinopathy, including an awareness of potential barriers to and facilitators of engaging with exercise, patients' and providers' prior experience and beliefs, and the importance of patient education, self-management and the patient-healthcare professional relationship.

Limitations: Despite a large body of literature on exercise for tendinopathy, there are methodological and reporting limitations that influenced the recommendations that could be made.

Conclusion: The findings provide some support for the use of exercise combined with another conservative modality; flexibility and proprioception exercise for the shoulder; and a combination of eccentric and concentric strengthening exercise across tendinopathies. However, the findings must be interpreted within the context of the quality of the available evidence.

Future work: There is an urgent need for high-quality efficacy, effectiveness, cost-effectiveness and qualitative research that is adequately reported, using common terminology, definitions and outcomes.

Study registration: This project is registered as DOI: 10.11124/JBIES-20-00175 (scoping review); PROSPERO CRD 42020168187 (efficacy reviews); https://osf.io/preprints/sportrxiv/y7sk6/ (efficacy review 1); https://osf.io/preprints/sportrxiv/eyxgk/ (efficacy review 2); https://osf.io/preprints/sportrxiv/mx5pv/ (efficacy review 3); PROSPERO CRD42020164641 (mixed-method review).

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List of abbreviations

ACTIVE	Authors and Consumers Together Impacting on Evidence
ANZCTR	Australia and New Zealand Clinical Trials Registry
AT	Achilles tendinopathy
CrI	credible interval
DASH	Disabilities of the Arm, Shoulder and Hand
ESWT	extracorporeal shockwave therapy
EU-CTR	European Union Clinical Trials Registry
GRADE	Grading of Recommendations Assessment, Development and Evaluation
GRIPP2	Guidance for Reporting Involvement of Patients and the Public 2
GTPS	greater trochanteric pain syndrome
HDI	Human Development Index
HEP	home exercise programme
ICON	International Scientific Tendinopathy Symposium Consensus
JBI	Joanna Briggs Institute
MT	manual therapy
NMA	network meta-analysis
NSAID	a nonsteroidal anti-inflammatory drug
NPRS	numerical pain rating scale
NRS	numerical rating scale
OMERACT	Outcome Measures in Rheumatoid Arthritis Clinical Trials
PFC	physical function capacity
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
PRISMA-SCR	Preferred Reporting Items for Systematic reviews and Meta-Analyses – Extension for Scoping Reviews
PRP	platelet-rich plasma
PTTD	posterior tibial tendon dysfunction
QoL	quality of life
RC	rotator cuff
RCRSP	rotator cuff-related shoulder pain
RCT	randomised controlled trial
ROM	range of motion
SPADI	Shoulder Pain and Disability Index
SUCRA	surface under the cumulative ranking curve
TA	treatment arm
TIDIER	Template for Intervention Development and Replication
VAS	visual analogue scale
VISA-A	Victorian Institute of Sports Assessment – Achilles
VISA-P	Victorian Institute of Sports Assessment – Patella
VPC	variance partition coefficient

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Report Supplementary Material 9 Data extraction form mixed methods (quantitative)

Supplementary material can be found on the NIHR Journals Library report page (https://doi.org/10.3310/TFWS2748).

Supplementary material has been provided by the authors to support the report and any files provided at submission will have been seen by peer reviewers, but not extensively reviewed. Any supplementary material provided at a later stage in the process may not have been peer reviewed.

Plain language summary

Tendons are cords of strong, flexible tissue that attach muscles to bones, allowing joints to move. Tendinopathy is a common condition that can affect any tendon in the body, causing pain and limiting function. Exercise is often used to treat tendinopathy.

We examined over 500 research papers on exercise for tendinopathy. The most common tendons to be studied were the calf (Achilles), knee (patellar), elbow and shoulder. Strengthening exercise was studied most often, especially in lower-limb tendinopathy. Other types of exercise such as stretching, balance and aerobic activity were less common, but were used to some extent in the upper and lower limbs.

We found that exercise therapy is safe and beneficial for the tendinopathies that have been studied to date. Exercise may be most beneficial when combined with another intervention such as injection or electro-therapy. Strengthening exercise may be most beneficial for lower-limb tendinopathies. However, more research is needed on the type of strengthening and the dosage, such as how many exercises and how much resistance to use. Shoulder tendinopathies may benefit from exercise that targets joint flexibility and position more than strengthening.

We also found that people who receive exercise therapy for tendinopathy are generally satisfied with the effect it has on their symptoms. Finally, we found that an individualised, person-centred approach to delivering exercise therapy is valued by people with tendinopathy. They also believe that the patient-healthcare provider relationship is important for promoting the confidence and motivation people need to continue with exercise programmes, especially when they complete them independently.

Although we examined a lot of papers, many of the studies were low quality. This means there is still a need for high-quality studies to tell us how effective specific types of exercise are for specific tendinopathies. There is also a need for more studies on patients' and professionals' experiences of receiving or providing exercise for tendinopathy.

Scientific summary

Background

Tendinopathy refers to a spectrum of changes in damaged or diseased tendons leading to pain and functional impairment, often chronic or recurrent in nature. Tendinopathy can affect any muscle-tendon unit in the body but is most reported in the Achilles, patellar, lateral elbow, rotator cuff and hip tendons. Tendinopathy is common, affects all age-groups and, although often associated with athletic populations, it is also prevalent in non-athletic and sedentary populations.

Tendinopathy is primarily managed conservatively using exercise therapy that may consist of one or more types of exercise including resistance, flexibility, proprioception, balance and whole-body exercise.

A substantive number of studies and systematic reviews have been conducted on various aspects of exercise for tendinopathy. These mostly comprise efficacy studies, with a growing trend towards qualitative studies of lived experience. Previous systematic reviews have typically focussed on individual tendinopathies and included small numbers of homogeneous studies.

Driven by the need for clear evidence-based guidance to inform clinical practice in this field, the current mixed-methods evidence synthesis project was designed to comprehensively map the research conducted to date, and to take an inclusive approach to synthesising the evidence on efficacy, feasibility and acceptability of exercise for tendinopathy, to make recommendations for practice and research.

Review questions

The specific review questions were as follows: (1) What exercise interventions have been reported in the literature and for which tendinopathies? (2) What outcomes have been reported in studies investigating exercise interventions for tendinopathies? (3) Which exercise interventions are most effective across all tendinopathies? (4) Does type/location of tendinopathy or other specific covariates affect which are the most effective exercise therapies? And (5) how feasible and acceptable are exercise interventions for tendinopathies?

Methods

We conducted an initial scoping review to address questions 1 and 2, followed by an efficacy workstream consisting of three systematic reviews with meta-analyses to address questions 3 and 4, and a convergent segregated mixed-method systematic review to address question 5. All reviews are reported according to the PRISMA 2020 statement and relevant extensions.

Scoping review: Using Joanna Briggs Institute (JBI) methodology and an a priori protocol made publicly available on Open Science Framework (OSF) and published in JBI Evidence Synthesis, we searched for studies and systematic reviews on any exercise therapy for any tendinopathy experienced by people of any age or sex. Inclusion was limited to studies published in any language from 1998 onwards and conducted in countries with very high human development (as defined by the United Nations Development Programme). In April 2020 we searched MEDLINE, CINAHL, AMED and SPORTDiscus via EBSCOhost, EMBase via Ovid, the Cochrane library (controlled trials, systematic reviews), JBI Evidence Synthesis, PEDRo and Epistemonikos. We also searched six trial registries, five grey literature databases and Google Scholar. Search results were deduplicated in Proquest® RefWorks. They were then imported to Covidence systematic review software (Melbourne, Australia) where title/abstract followed by full-text screening was conducted by two reviewers independently, with conflicts resolved by a third reviewer. Data were extracted from included studies using a bespoke data-extraction tool developed by the review team using Microsoft Excel®.

Efficacy reviews: Using effectiveness review methodology and a priori protocols registered on PROSPERO (overarching methodology) and OSF (review-specific methods), three efficacy reviews were conducted. Efficacy review 1 quantified efficacy through calculation of a range of effect sizes from exercise-only interventions. In efficacy review 2, pairwise effect sizes were calculated to quantify comparative efficacy between different exercise therapies based on their dominant therapy class (e.g. resistance, flexibility, proprioception) and their dominant therapy type (e.g. eccentric-only, static stretching, joint position sense). In efficacy review 3, pairwise effect sizes were calculated between exercise-only therapies, non-exercise therapies (e.g. surgery, injection, manual therapy (MT)) and combined therapies to quantify comparative efficacy across a range of therapy classes frequently used in the management of tendinopathy. Studies were identified from the scoping review search, a search update (19 January 2021) and reference and citation searching of systematic reviews included in the scoping review. Screening was conducted as described above. Risk of bias and data extraction were completed by two independent reviewers. The Grading of Recommendations, Assessment, Development and Evaluations framework was used to assess the strength of evidence.

Mixed-method review: Using JBI methodology and an a priori protocol (PROSPERO) we searched for quantitative, qualitative and mixed-methods studies exploring any aspect of feasibility or acceptability of exercise for tendinopathy from patients' or providers' perspectives. Studies were identified from the scoping review and effectiveness update searches, and a further search (29 March 2021) to locate additional studies. Screening was conducted as described above and methodological quality was assessed by two reviewers independently using JBI critical appraisal tools, with conflicts at each stage resolved by discussion or a third reviewer. Data were extracted from quantitative studies using a bespoke data-extraction tool developed by the review team in Microsoft Excel®. Data were extracted from qualitative studies using the data-extraction tool in JBI SUMARI software. Data extraction for both data types was conducted by two reviewers independently with conflicts resolved by discussion or a third reviewer. A convergent segregated approach to data synthesis was applied, where each data type was synthesised independently, followed by integration of findings from the quantitative and qualitative syntheses using comparative analysis. Data synthesis was an iterative process involving four reviewers.

Results

Scoping review: The search identified 13,729 unique studies. Following screening, 555 studies were included in the review, 119 of which were systematic reviews. A range of exercise interventions were reported across multiple tendinopathies, with Achilles, lateral elbow, patellar and rotator cuff-related shoulder pain (RCRSP) the most studied. Strengthening exercise was most frequently reported (84%), with eccentric exercise the most common mode for Achilles (89%), patellar (85%) and lateral elbow tendinopathies (44%). Flexibility exercise was more commonly reported in the upper (≈60%) than lower limb (≈25%). Exercise therapies for RCRSP showed the greatest range with respect to mode of exercise. Reporting of exercise interventions was highly variable such that few were identified as being replicable. A range of health domains and outcome measurement tools were reported, with lack of consensus a key finding in this review. Disability was the most common primary health domain for RCRSP (65%), Achilles (68%) and patellar tendinopathies (75%), and physical function capacity was most common for lateral elbow tendinopathy (49%). Impairment-based outcome measures were dominant across tendinopathies, with psychosocial outcomes rarely reported. Few true effectiveness studies were identified, with most studies being conducted under controlled circumstances. Therefore, efficacy, rather than effectiveness, was explored in the contingent reviews.

Efficacy reviews: 204 studies comprising 467 treatment arms (TAs) and 12,081 participants were identified that met the inclusion criteria to be included in at least one of the reviews (review 1: 125 studies/188 TAs; review 2: 55 studies; review 3: 201 studies). In the context of low and often very low strength of evidence, the efficacy reviews concluded that exercise therapy is safe and efficacious, and that patients are generally satisfied with the outcome and perceive their improvements to be substantive. RCRSP may benefit from exercise interventions that focus on flexibility and proprioception more than strengthening. Resistance training that combines both concentric and eccentric exercise may be most beneficial given the intensities and frequencies commonly adopted in practice. Combining exercise with a non-exercise adjunct such as electro-therapy, injection or taping may be most beneficial and could be considered in the early phase of management.

Mixed-method review: 96 reports from 94 studies were included in the review (85 quantitative, 11 qualitative). *Quantitative findings:* For feasibility, measures of adherence, attendance and fidelity were reported in 75, 13 and 3 studies respectively. Self-reported exercise adherence was good (at least 70%) and attendance to supervised exercise sessions excellent (90%). Different approaches to measuring fidelity were used in the three studies, with a range of findings reported. Acceptability was reported in 17 studies as tolerability (n = 15), satisfaction with exercise (n = 2), willingness to do the exercise (n = 2), helpfulness (n = 1) and how easy it was to fit into daily activities (n = 1), with some studies including more than one measure. The findings provide evidence that exercise for tendinopathy is acceptable, but heterogeneity in defining, measuring and reporting the various dimensions of acceptability combined with the limited number of studies reporting acceptability limits our ability to draw firm conclusions.

Qualitative findings: 68 findings from 11 studies generated two synthesised findings: (1) patients and healthcare professionals report a range of highly personalised experiences and opinions of exercise therapies along with several barriers and facilitators to adhering to exercise; therefore, a person-centred, individualised approach should be used when delivering such interventions to people with tendinopathy; and (2) patients and healthcare professionals place value on appropriate and timely patient education facilitated by an effective 'therapeutic alliance' between patient and physiotherapist, to promote motivation and confidence in the exercise therapy being undertaken.

Integration of quantitative and qualitative findings: The qualitative findings largely supported and explained the quantitative findings. For example, qualitative findings explain the factors that can influence adherence, including barriers, facilitators, beliefs, previous experiences and the 'therapeutic alliance'. They provide explanation for supervised exercise being adhered to more than unsupervised, due to levels of confidence. They also help to explain the range of tolerability reported: beliefs about the pain–exercise relationship, the individualised response to pain, and the impact of symptomatic response all moderate an individual's tolerability of therapeutic exercise. Environmental factors including group-based exercise and remote supervision via telehealth had been explored in the qualitative but not quantitative studies.

Strengths and limitations

Strengths: All tendinopathies and all forms of exercise were included in this evidence synthesis, allowing a large amount of data to be included. The modelling approaches featured in both the efficacy and mixed-methods reviews attempted to synthesise these data, identifying general results and where possible exploring heterogeneity to generate novel and clinically relevant findings. In addition, the inclusive approach with regard to tendinopathies, participants, therapies and outcomes enabled the review to synthesise diverse sets of information from both the providers' and patients' perspectives to provide the most comprehensive summary of the field to date. We excluded few studies based on language of publication, as we used both automated and personal translation where possible.

Limitations: Restricting inclusion to studies conducted in countries with very high human development, by applying the Human Development Index, may have excluded some potentially relevant studies but does make the findings more relevant to the UK context. Several limitations in the available body of evidence were identified through conducting this project and include low-quality evidence, lack of agreed definitions (e.g. adherence), lack of standardised measurements (e.g. feasibility, acceptability), lack of consensus on outcome domains and measurement tools, poor reporting of exercise interventions and patient factors, and a lack of qualitative research.

Conclusions and recommendations

In conclusion, this comprehensive, robust, inclusive mixed-methods evidence synthesis has provided an extensive map of the contemporary research on exercise for tendinopathy, evaluated the efficacy and comparative efficacy of exercise across the common tendinopathies and identified what is known about the feasibility and acceptability of exercise therapy for the management of tendinopathy from patients' and providers' perspectives. The following recommendations can be made.

Practice recommendations: Outcome domains are important to consider when evaluating the outcome of specific exercise interventions, with subjective measures likely to result in larger relative improvements compared to objective outcomes. Gathering information on patient satisfaction, including reasons for (dis)satisfaction, would be useful to inform practice. Resistance training should be prescribed at an appropriate intensity and frequency to increase muscle strength and subsequent positive adaptations to tendons. Use of flexibility and proprioceptive exercise should be considered for RCRSP rather than using resistance exercise in isolation; flexibility regimes may also be considered for Achilles tendinopathy. A focus on eccentric resistance exercise above all other treatments does not appear warranted. Given the loading protocols commonly used, it is likely that standard resistance exercise practices that combine concentric and eccentric exercise will be superior to eccentric-only and easier to implement in practice. Exercise could be combined with other non-exercise adjuncts earlier in the rehabilitative process. An individualised, person-centred approach should be taken when delivering exercise therapy to people with tendinopathy.

Research recommendations: There is still a need for high-quality adequately powered research in the following areas: dose parameters and their interactions with patient characteristics; cost-effectiveness, which may also investigate models that include multiple modalities earlier in the therapeutic process; true effectiveness studies such as pragmatic trials to better quantify the effectiveness of current and developing therapeutic models. There is a need for exercise interventions to be carefully developed and tested, including their feasibility and acceptability, prior to moving to studies of efficacy and effectiveness. There is also a need for further high-quality qualitative research on patients' and healthcare professionals' perceptions and experiences of exercise for tendinopathy to generate a greater depth of understanding of the factors that influence efficacy of exercise therapy and implementation in the real-world clinical setting. Standard reporting of exercise for tendinopathy requires considerable improvement, including the development of, or consensus agreement on, definitions (e.g. of exercise types, intervention components, adherence, feasibility), the use of core outcome sets, and full and transparent reporting in compliance with reporting checklists. Development of a taxonomy for guidance on reporting exercise therapy for tendinopathy, which is introduced in this project, would benefit from further research involving all key stakeholders (e.g. people with experience of exercise for tendinopathy, clinicians, academics, researchers).

Policy recommendations: Research funders and service providers need to fund and facilitate research within different care settings to enable cost-effectiveness, acceptability and adherence comparisons between different modes of delivery of exercise interventions for tendinopathy to be conducted. Service provision may need to be adapted and funded to enable a person-centred approach to care and access to additional non-exercise treatment modalities when appropriate. This may include the need for extended periods of intervention to be enabled in order that the timescales of physiological tendon change are reflected in interventions. The use of technologies that facilitate better patient engagement with exercise therapy and more consistent self-reporting of adherence, outcomes and side effects should be explored.

Study registration

This project is registered as:

DOI: 10.11124/JBIES-20-00175 (scoping review)

PROSPERO CRD42020168187 (efficacy reviews overarching methodology)

https://osf.io/preprints/sportrxiv/y7sk6/ (efficacy review 1)

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Chapter 1 Introduction

Tendinopathy

Definition

Tendinopathy is the term used to describe a spectrum of changes in damaged or diseased tendons that lead to pain and functional impairment.[1] It is primarily a degenerative condition related to overuse and is characterised by dysfunction and localised pain with loading that is variably associated with a range of altered tendon structural features.[1] Tendinopathy can affect any muscle-tendon unit in the body; however, it is most reported in the Achilles, patellar, lateral elbow, rotator cuff (RC) and hip tendons.[2]

Epidemiology

Tendinopathy is prevalent in many sports and at all levels of participation but also affects non-athletic populations. Children, adolescents and adults of all ages can be affected by tendinopathies, many of which have a chronic or recurrent course,[2] with adults aged 18–65 most affected. Lower-limb tendinopathy has a reported incidence of 10.52 per 1000 person-years, which is greater than the incidence of osteoarthritis (8.4 per 1000 person-years).[3–5] The prevalence of upper-limb tendinopathies has been estimated between 1.3% and 21%.[6,7] Prevalence of tendinopathy increases with age and women are more likely to be affected than men. Tendinopathy is therefore a common, painful and functionally limiting condition for which those affected by it seek support from healthcare professionals. It is therefore essential that healthcare professionals have the best available evidence on which to base their management of tendinopathy.

Aetiology

The aetiology of tendinopathy is multifactorial and complex, with the exact pathogenesis unclear.[1] However, excessive repetitive loading without adequate recovery is widely recognised as a contributing factor to its onset and progression.[8] These increases in load are thought to make tendons susceptible to pathological changes and degeneration, where tendon capacity is insufficient to cope with the mechanical demand. Other risk factors are associated with specific genetic factors, drug reactions, inflammatory conditions and a range of cardiometabolic co-morbidities.[1] Therefore, treatment options for tendinopathy typically focus on reducing pain and improving function by managing load demand and improving capacity through exercise. There is evidence that heavy, slow, progressive loading remodels tendon tissue over the medium term.[9] Changes to structural outcomes such as neovascularisation and tendon morphology (cross-sectional area of tendon) have been reported as a response to therapeutic exercise.[10] However, there is a mismatch between tendon structure and the degree of tendinopathic function and associated pain as improvements in observable structural change do not necessarily translate to clinical outcomes. Additional modalities are often deployed in an attempt to improve outcomes,[11] which are partial at best, as reflected in the lack of studies demonstrating long-term effectiveness.

Exercise therapy

Exercise therapy is the mainstay of conservative management of tendinopathy, often used as a first- or second-line intervention, with only a small proportion of individuals seeking surgery to alleviate pain. Exercise therapy frequently includes resistance exercise, which can be classified by training variables such as contraction mode (isotonic-eccentric,[12] isotonic-concentric,[13] isometric,[12]) or load intensity scaled relative to a maximum (e.g. moderate load or heavy load), or by a combination of factors (e.g. time under tension[14]). However, other types of exercise, including flexibility, proprioception and balance, and whole-body vibration, with varying dosage and intensity, have also been reported.[8,15,16] In experimental studies, the success of exercise therapy is often measured against alternative exercise types, or splinting, bracing, electro-therapy modalities, manual therapies, injection therapies or, less commonly, a control situation (placebo, sham or wait-and-see).

Exercise therapy comprises the bulk of the tendinopathy management research to date, with much of that research focussed on eccentric resistance training,[8] reported to be effective primarily in the management of Achilles and patellar tendinopathies. Several exercise therapy protocols have been investigated, including the Alfredson protocol, which comprises eccentric-only action,[17] and more mixed or combined protocols[18–20] that emphasise eccentric work but also involve concentric exercise with a focus on power and progression by speed and load to simulate the mechanism of injury, which often occurs at higher velocities.[19] However, at present no single protocol appears to have demonstrated superiority.

Other types of resistance training, including isotonic, combined and heavy slow resistance exercise,[18,21] have also been recommended for management of some tendinopathies (e.g. patellar[12]). In addition to contraction mode and intensity, other factors including overall dosage (e.g. intensity, volume and frequency) and contextual factors such as supervision may also play a role in efficacy of exercise for tendinopathy and have also been studied.[22–24]

Range of movement and flexibility exercises are often incorporated within strengthening regimes to facilitate improvements in the early phase of rehabilitation.[8] In the rehabilitation of shoulder-related tendinopathies, proprioceptive exercise including movement retraining and sensing of force and joint position have been used to retrain normal patterns of muscle recruitment, with supportive evidence provided in trials and systematic reviews.[25,26] Similarly, balance and core stabilisation exercises have been recommended for patients presenting with lumbo-pelvic instability associated with patellar and Achilles tendinopathies.[15]

Depending on the complexity of the tendinopathy involved, exercise may be used in isolation or as part of a multi-component intervention, where it is often combined with modalities including the use of extracorporeal shockwave therapy (ESWT),[27] laser therapy[28] or corticosteroid injections or following regenerative procedures such as prolotherapy, platelet-rich plasma (PRP) or stem-cell injection therapies.[29] This approach reflects current expert opinion and evidence syntheses that recommend exercise-based physiotherapy as the first-line management for tendinopathy with the addition of other interventions in recalcitrant cases.[2,11]

Education is typically deployed alongside exercise and other interventions but is variably reported and has not had extensive intervention development and testing. There are encouraging indications of efficacy,[30] indicating the need to establish the link with treatment adherence and outcome, particularly as adherence is often considered the main challenge to effectiveness of exercise interventions.[31]

Rationale for the evidence synthesis

This body of work aimed to examine the evidence base on exercise therapy for tendinopathies, specifically evaluating the effectiveness of exercise therapies to make recommendations for practice and future research. Tendinopathy intervention studies can be placed on a continuum, with progression from efficacy (performance under ideal and controlled circumstances) to effectiveness (performance under 'real-world' conditions), in keeping with intervention studies in any field.[32] Most of the tendinopathy intervention research appears to comprise efficacy, rather than true effectiveness studies such as large simple or pragmatic trials.[31,33] The focus appears to have been on comparisons between interventions and the moderating effects of dosage,[22] and contextual factors such as supervised versus unsupervised exercise,[34] with highly selected, homogeneous populations, trained providers and standardised interventions.[32] This has inevitably impacted on the body of work reported here and scope of the practice recommendations that are made. Whilst the first contingent synthesis employed 'effectiveness review methodologies', it was expected that the synthesis would investigate efficacy given the composition of the included research.

Previous systematic reviews on exercise for tendinopathy have typically focussed on individual tendinopathies[35] and where meta-analyses were deemed appropriate, these have generally focussed on small numbers of homogeneous studies of specific intervention types, compared specific exercise modes (e.g. eccentric vs. concentric), or considered exercise as a single entity. This approach does not offer comparative efficacy of the wide range of exercise interventions, leading to a lack of established hierarchy of tendinopathy interventions. This project aimed to address that gap, that is, to explore which exercise therapies are most effective across all tendinopathies and, where possible, within relevant subgroups.

With increasing pressure and demands on healthcare services, the need for clear evidence-based practice guidance is increasingly important. To synthesise evidence in such a way that it is optimally relevant to real-world clinical practice, it is important to consider the factors that may moderate exercise therapy efficacy, for example the feasibility of delivering, and acceptability of undertaking, specific exercise interventions. This project therefore incorporated synthesis of evidence in these domains alongside synthesis of evidence of efficacy.

Due to the heterogeneity of tendinopathy sites, target populations and exercise protocols, and the focus on efficacy, feasibility and acceptability, a broad and comprehensive evidence synthesis was essential. This body of work therefore comprises two main phases. Firstly, a large scoping review was undertaken to map the tendinopathies and exercise interventions that have been studied, and the outcomes that have been reported. This informed the design of the second phase, in which several efficacy reviews were undertaken, alongside a mixed-method review on feasibility and acceptability of exercise for tendinopathy.

The novel approach for the efficacy reviews was to combine exercise-related research across all tendinopathies and to identify commonalities and heterogenic treatment effects, whilst also considering relevant variables and participant characteristics. We employed the use of a range of meta-analysis models including network meta-analyses (NMA) and meta-regressions where possible to best synthesise complex and heterogeneous data to compare the efficacy of different interventions across a range of tendinopathies and outcomes to better establish a treatment hierarchy. This extensive modelling approach was adopted to enhance existing knowledge regarding the most effective type of exercise therapy across multiple tendinopathy outcomes. This body of work is also novel in its simultaneous inclusion of evidence on efficacy, feasibility and acceptability of exercise therapy for tendinopathy. By conducting such a comprehensive evidence synthesis, it is possible to make some clear recommendations with direct implications for practice and service commissioners. Inevitably, findings from this synthesis have also identified gaps in the evidence base and recommendations are made that will guide future high-quality primary research and the prioritisation of research needs.

Structure of the report

The aim and specific review questions are outlined next (see *Chapter 2*), followed by the overall design for the body of work (see *Chapter 3*). The specific methods and findings of phase 1 (scoping review) are presented in *Chapter 4*. Thereafter, the specific methods and findings of phase 2 are presented in *Chapter 5* (efficacy reviews) and *Chapter 6* (mixed-method feasibility and acceptability review). Findings are discussed in each chapter, with a final synthesis and interpretation presented in *Chapter 7* (discussion), along with recommendations for policy, practice, and research.

Chapter 2 Aim and objectives

The aim of this mixed-methods evidence synthesis was to examine the evidence base on exercise therapy for tendinopathies in order to make recommendations for clinical practice and future research. The specific review questions were as follows:

1. What exercise interventions have been reported in the literature and for which tendinopathies?
2. What outcomes have been reported in studies investigating exercise interventions for tendinopathies?
3. Which exercise interventions are most effective across all tendinopathies?
4. Does type/location of tendinopathy or other specific covariates affect which are the most effective exercise therapies?
5. How feasible and acceptable are exercise interventions for tendinopathies?

Review questions 1 and 2 were addressed by an initial scoping review. Thereafter, contingent systematic reviews were undertaken to address questions 3, 4 (effectiveness reviews) and 5 (mixed-method review).

Chapter 3 Overall design

Methodology

A mixed-method evidence synthesis was conducted in two phases in order to address the review questions (see *Figure 1*). This approach was informed by previous published work,[36] which demonstrated its suitability for addressing clearly defined objectives and assimilating evidence according to relevance, rather than research design alone. This approach had also been employed by several of the review team members in a recent evidence synthesis workstream.[37]

In phase 1 we conducted a comprehensive scoping review to map the tendinopathies, exercise interventions and outcomes reported in the exercise for tendinopathy literature. This enabled us to understand and describe the research field and informed the conduct of the contingent reviews by establishing the nature of the evidence, identifying domains that could be explored. Furthermore, it ensured we did not duplicate pre-existing high-quality syntheses. Few true effectiveness studies were identified, with most being conducted under controlled circumstances. Therefore, efficacy, rather than effectiveness, was explored in the contingent reviews. In phase 2 we conducted two workstreams: (i) efficacy of exercise for tendinopathy (consisting of three reviews) and (ii) feasibility and acceptability of exercise for tendinopathy (mixed-method review). Each review was informed by an a priori protocol and is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[38] and extension for scoping reviews (PRISMA-ScR).[39] Specific methods used in each review are reported in *Chapters 4–6*.

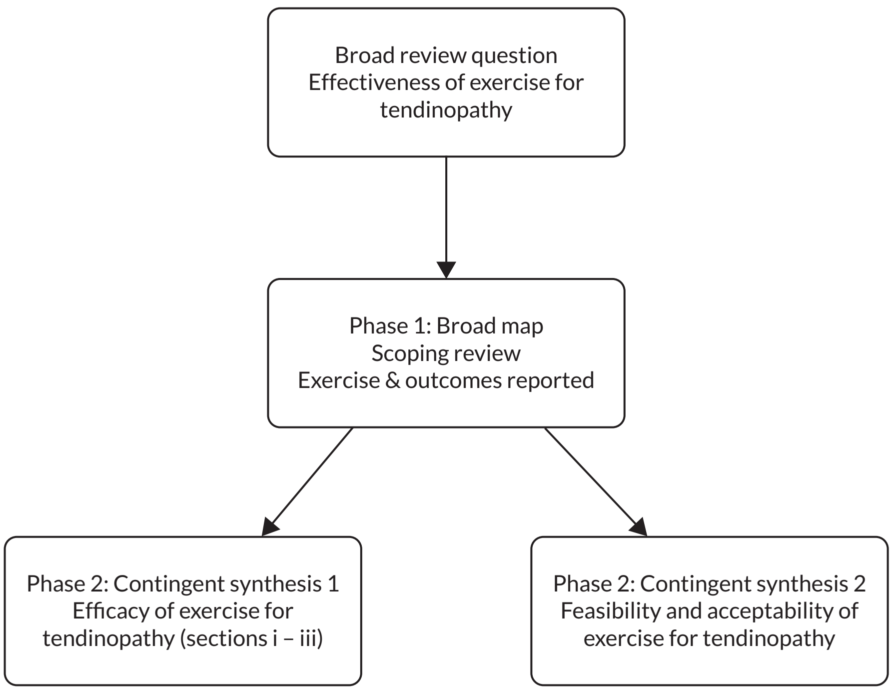

FIGURE 1 Overall approach to the evidence synthesis, illustrating how the scoping review preceded the four contingent syntheses.

Population

The population for both phases of this evidence synthesis was people of any age or sex with a diagnosis of tendinopathy of any severity or duration and at any of the common anatomical locations. The terminology adopted for shoulder tendinopathy in the reviews was rotator cuff-related shoulder pain (RCRSP) as defined by Lewis (2016).[40] RCRSP describes the signs and symptoms of pain and impaired movement and function of the shoulder that may arise from one or more structures, and encompasses subacromial pain/impingement syndrome, RC tendinopathy and subacromial bursitis.[41] We have used the term RCRSP in this review in recognition of the difficulty in diagnosing the patho-anatomical cause of shoulder pain,[40,41] and due to exercise therapy being the intervention of choice for its management.[42,43] We included studies where participants were described as having tendinopathy, subacromial impingement syndrome (as the terms have been used interchangeably in previous literature), or RCRSP. Therefore, participants with shoulder pain in our review may have tendinopathy with or without involvement of other structures. In keeping with previous research, we excluded large, full-thickness tears (for the shoulder and all other tendinopathies), and samples where tear size could not be determined.[44] We also excluded plantar heel pain as this is not considered to be a true tendinopathy and may respond differently to exercise compared to true tendinopathies.[45] We excluded hand and wrist tenosynovitis for the same reason.

The health technology

The health technology being evaluated was any type or format of exercise therapy for the treatment of any tendinopathy of any aetiology or duration. For the purpose of this review, exercise therapy was defined as any plan of physical activities designed to facilitate recovery or support longer-term self-management. Since physical activity is defined as 'any bodily movement produced by skeletal muscles that requires energy expenditure',[46] we included a broad range of exercise therapies, in isolation or combination. These included but were not limited to eccentric, concentric, heavy slow resistance, stretching, proprioceptive, cardiovascular and whole-body exercise. The exercise therapy could be used as a first- or second-line intervention for tendinopathy and could be delivered in isolation or with adjunct therapies including but not limited to manual therapies, ESWT, laser therapy, taping and splinting and various types of injection. The exercise therapy could be delivered in any setting including primary care, secondary care, community locations and in people's own homes as a home exercise programme (HEP). A range of health or exercise professionals or support workers could be involved in delivering the exercise therapy, including but not limited to physiotherapists, medical doctors, strength and conditioning coaches and personal trainers. We included exercise therapy delivered in a supervised or unsupervised (self-management) manner in any setting, using any mode or delivery.

Stakeholder involvement

We involved stakeholders in two ways. Firstly, an individual with lived experience of exercise for tendinopathy who had previously contributed to developing the proposal was an active member of our project management group and study steering committee. She participated in meetings, reviewed public-facing materials and assisted us with interpreting findings from the lived experience viewpoint. An NHS specialist musculoskeletal physiotherapist with an interest in tendinopathy also contributed to the project management group. She contributed to meetings, reviewed output and assisted with interpreting findings from the practitioner's viewpoint. We had anticipated recruiting more than one person with lived experience and one professional to be involved in the management of the review. However, recruitment coincided with the start of the COVID-19 pandemic, when many professionals were advised to cease non-essential activities. This and the move to exclusively online communication were undoubtedly limiting factors. Nonetheless, the two stakeholders provided valuable input to the design and delivery of the review.

We held stakeholder workshops towards the end of phase 1 (scoping review), to inform the design of the contingent reviews. These were originally intended to be face-to-face events held in Aberdeen and London but were instead delivered online via Microsoft Teams due to COVID-19 restrictions on gatherings. People with lived experience of receiving exercise for tendinopathy (general population and performance athletes), strength and conditioning professionals and health professionals took part in two workshops, which provided valuable insight to assist interpretation of the scoping review findings and informed planning of the contingent syntheses. In addition to the workshops, largely due to the success of the online environment for widening participation, we also used an electronic survey as an additional means of involving additional stakeholders, particularly those based in different countries and time-zones for whom workshop participation would have been challenging. In this way we were able to approach internationally recognised authors in the field of tendinopathy and combine their views with those from the stakeholder workshops, providing a comprehensive interpretation of the findings. We also asked these internationally recognised authors to share the survey using their social media channels, thereby increasing its reach. Full details of the workshops and survey are provided in *Chapter 4*.

We are in the process of planning dissemination workshops for late 2022, which will be held via a combination of online and face-to-face delivery methods. We will invite participants from the workshops, and will recruit additional participants from NHS, private practice, performance sport, academia and the public to a series of workshops where we will present the findings of the contingent syntheses and seek participants' views on implementation of the findings into practice and future research. This will ensure that we translate the findings of this evidence synthesis across the research-practice gap.

Stakeholder involvement in this review was therefore commensurate with recommendations specific to systematic reviews,[47] with varying levels of involvement at various stages throughout the review. *Table 1*

TABLE 1 Mapping stakeholder involvement to the ACTIVE framework[48]

Framework constructs	Involvement in this evidence synthesis
Who was involved?	• People with lived experience of receiving exercise for tendinopathy (delivered in either NHS, private physiotherapy or performance sport settings) • Physiotherapists (NHS, private and elite sport settings) • Other tendinopathy researchers
How were they recruited?	Advertised via • NHS Grampian Public Involvement Network • NHS Grampian physiotherapy services (staff email) • Social media accounts of project, project team members, Council for Allied Health Professions Research (CAHPR) • Purposive recruitment of individuals known to study team members
Approach	Combined approach • One-time for project management group and steering committee members • Continuous for workshops and survey
Methods	Direct and indirect methods used, dominated by direct • Direct (meetings, stakeholder workshops) • Indirect (electronic survey)
Stage and level of involvement	• Developing the question (2 people with lived experience) – *Influencing* • Oversight of the review (1 person with lived experience and 1 physiotherapist) – *Contributing* • Interpreting findings (3 people with lived experience and 9 professionals in stakeholder workshops and 26 professionals with experience of treating/managing/researching tendinopathy in online survey) – *Contributing* • Dissemination of findings (1 person with lived experience and 1 physiotherapist; reviewing infographics, plain English summaries, abstracts, manuscripts) – *Contributing*

maps user involvement in this review to the Authors and Consumers Together Impacting on Evidence (ACTIVE) framework[48] and reporting of user involvement has been guided by the GRIPP2 checklist (Guidance for Reporting Involvement of patients and the Public 2).[49]

Chapter 4 Phase I: Exercise therapy for tendinopathy: a scoping review

Review 1 summary

This chapter reports on phase 1, which aimed to map the tendinopathy exercise interventions and outcomes reported in the literature via a Joanna Briggs Institute (JBI) scoping review. Eligibility criteria included **Participants** (any age or gender with any tendinopathy), **Concept** (supervised or unsupervised exercise of any type or format, delivered by any professional with any outcome evaluated) and **Context** (any setting in any highly developed country). A comprehensive search strategy identified 22,550 sources of evidence. Following screening, 555 studies were included representing 25,490 participants from 31 countries. A range of exercise interventions were reported including strengthening, flexibility, aerobic, proprioceptive and motor control exercises; we mapped intervention reporting to the template for intervention description and replication (TIDieR) checklist. The main tendinopathies reported were RCRSP, Achilles, patellar and lateral elbow. A range of outcome measurement tools were reported; we mapped these to the International Scientific Tendinopathy Symposium Consensus (ICON) health-related domains for tendinopathy. The scoping review results, combined with the stakeholder workshops and survey that followed, directly informed the focus and methods of the Phase 2 contingent syntheses.

This chapter has informed the following manuscript:

Alexander, L.A., et al. Exercise therapy for tendinopathy: A scoping review mapping interventions and outcomes. SportRxiv preprint doi: https://osf.io/a8ewy/.

Methods

This scoping review was conducted in accordance with JBI scoping review methodology[50] and an a priori protocol was published in *JBI Evidence Synthesis*.[51] JBI scoping review methodology is the most up-to-date guidance for the conduct of scoping reviews. It is based on the foundational framework proposed by Arksey and O'Malley[52] and further developed by Levac, Colquhoun and O'Brien.[53] JBI methodology[50] built upon the previous approaches and developed comprehensive guidance for reviewers who are planning and conducting a scoping review. This scoping review is reported in accordance with the PRISMA-ScR.[39]

The aim of this scoping review was to comprehensively map the existing evidence on exercise for the management of tendinopathies, addressing the first and second review questions:

1. What exercise interventions have been reported in the literature and for which tendinopathies?
2. What outcomes have been reported in studies investigating exercise interventions for tendinopathies?

The results of this scoping review subsequently informed the contingent systematic reviews reported in *Chapters 5* and *6*.

Inclusion criteria

The inclusion criteria were defined for this scoping review using the 'PCC' mnemonic relating to the Participants, Concept and Context, and informed by the definitions of participants and health technology provided in *Chapter 3*.

Participants

As described in *Chapter 3*, we included sources of evidence where participants were people of any age or gender with a diagnosis of tendinopathy of any severity or duration and at any anatomical location.

Concept

As described in *Chapter 3*, exercise interventions that could be categorised as one or more of strengthening, flexibility, aerobic, proprioception or motor control were included. They could be first- or second-line interventions and could be used in isolation or in combination with other interventions. Studies focussing on exercise following surgical repair were excluded as the review concerned non-surgical management of tendinopathy. Exercise interventions delivered by any health, exercise professional or support worker, either supervised or unsupervised, were included. Any outcomes used to evaluate exercise interventions for tendinopathy were included.

Context

Any setting including primary care, secondary care, community locations, clinics or people's homes in any nation classified as having very high human development (defined as the top 62 ranked countries in the 2019 Human Development Index (HDI))[54] at the time of conducting the review were included. The top 62 HDI countries were categorised as having 'very high human development' and included the UK, therefore findings from studies conducted in any of these 62 countries could be considered for generalising to the UK setting.

Search strategy

Following the JBI three-step search strategy, an initial search using exercise and tendinopathy terms was conducted in CINAHL and MEDLINE (step 1). Review of the titles, abstracts and index terms from the initial search results informed the development of a full search strategy that was constructed using a combination of subject headings and keywords which was then tailored to each database (step 2). The full search strategies for all databases and grey/unpublished literature were developed by the review team, which comprised experienced reviewers (n = 4), subject experts (n = 5) and a specialist information scientist. The search strategies were piloted and amended by the team before the final searches were conducted to ensure specificity and sensitivity. The following databases were searched: MEDLINE, CINAHL, AMED, SPORTDiscus (all EBSCOhost), EMBase (Ovid), Cochrane library (Controlled trials, Systematic reviews), JBI Evidence Synthesis, PEDRo and Epistemonikos. Grey and unpublished literature was searched using trial registries (ClinicalTrials.gov, ISRCTN Registry, The Research Registry, EU-CTR [European Union Clinical Trials Registry], ANZCTR [Australia and New Zealand Clinical Trials Registry]), Open Grey, MedNar, The New York Academy Grey Literature Report, Ethos, CORE, and Google Scholar using modified search terms. All searches were conducted in April 2020 and the full search strategies are presented in *Appendix 1*.

Sources of evidence published in any language where a translation was accessible via Google Translate or the review team's international networks were included. The seminal publication of Alfredson *et al.*'s[17] eccentric protocol for Achilles tendinopathy (AT) marked the start of a proliferation of high-quality research on the efficacy and explanatory mechanisms of well-described exercise interventions for tendinopathy. Therefore, databases were searched from 1 January 1998 onwards.

Step 3 usually involves hand-searching the reference lists of included studies. However, due to the comprehensive search strategy and volume of studies located and in consultation with our steering committee, it was decided not to conduct this step for the scoping review. Instead, we employed citation tracking using Scopus and hand-searching of reference lists of studies included in the scoping review as part of the efficacy review search strategy. The citation analysis enabled the review team to understand where articles were published (which journals and country), who was using the articles as well as identifying collaborative work between countries.

A range of study designs were included in this scoping review to ensure a comprehensive map was produced. The included study designs were experimental, quasi-experimental, observational, pilot, mixed-methods, qualitative and systematic review. The inclusion of systematic reviews enabled previous evidence syntheses to be mapped in order to avoid replication in the contingent reviews. Other designs including opinion, narrative or other non-systematic reviews, protocols and case studies were excluded.

Screening for inclusion

Following the search, all results were uploaded into ProQuest® RefWorks and duplicates were removed. Sources were then imported to Covidence (Melbourne, Australia) systematic review management software for two-level screening, following the identification and removal of remaining duplicates identified by Covidence. Firstly, titles and abstracts were screened independently by two reviewers with conflicts identified by Covidence and resolved by a third reviewer. The full-text copies of all sources included following title and abstract screening were uploaded to Covidence. The full texts were then screened by two reviewers independently and all conflicts were resolved by a third reviewer. Training for all reviewers using the inclusion criteria was conducted in Covidence prior to the start of title and abstract screening. Ongoing communication occurred between reviewers throughout the screening stage via weekly team meetings and posts in Microsoft Teams. This enabled all queries around screening to be addressed in a timely manner. All sources excluded at full-text screening stage and the reasons for exclusion are available as supplementary material (*Supplementary Material 1*). Following full text screening, four tendinopathy experts external to the review team also reviewed the included study list for completeness.

Data extraction

A bespoke data-extraction tool (*Supplementary Material 2*) was developed for this review in Microsoft Excel® (Microsoft Corporation, Redmond, WA, USA). The tool was used to extract study demographic details as well as data related to the review questions.

The following demographic information was extracted from the included primary studies: author(s), year of publication, country, study title, aims/purpose, study design, participant details (age, gender, ethnicity, comorbidities and other characteristics), inclusion criteria, setting and tendinopathy diagnosis method. Extracted data relating to the review questions included: body area affected, tendinopathy type, the author's focus on exercise, that is, primary (exercise as the novel intervention being studied), secondary (exercise as the control arm to another novel intervention) or neutral (exercise being compared with other intervention/s where neither is the novel intervention or main focus of study); exercise intervention details including reporting and monitoring; treatment adjuncts; primary and secondary outcomes including health domains and tools used to evaluate interventions, and key findings.

Data extraction from included systematic reviews was limited to demographic information including year of publication, author(s), country, aims/purpose, study type, number of included studies, inclusion criteria, settings, body area affected and tendinopathy type, as information on interventions and outcomes was extracted from the primary studies.

Piloting and iterative development of the data-extraction tool was conducted by the review team over ten rounds prior to commencing final extraction. Ten per cent of data extraction was replicated in an informal assessment of consistency that was identified as appropriate and reflected the extensive piloting and discussions among the review team. As per the screening process, data extraction was supported by the weekly team meetings and regular Microsoft Team chat. In accordance with scoping review methodology, critical appraisal was not conducted in this review.[50]

Data synthesis

The extracted data were synthesised and integrated into a series of visual outputs to answer the review questions and present a comprehensive map of exercise interventions and outcomes; data are presented alongside an accompanying narrative in the Results section.

Extracted exercise intervention component data were mapped against the TIDieR checklist[55] to identify if full and accurate reporting of interventions had occurred. The review team modified the TIDieR checklist for the purposes of this scoping review. The TIDieR template requires one to identify and note the location of each criterion in the study and supporting detail. The review team added to each criterion a grading of 'Fully reported' (if criterion was fully described), 'Partially reported' (if some components of the criterion were described but lacked detail) and 'Not reported' (if there was not enough detail to satisfy a partially reported definition). An additional criterion was then added by the team to reflect overall reproducibility of the intervention which reflected 'Fully reproducible' (all criteria fully reported to enable replication of the intervention), 'Partially reproducible' (if exercise components were described (what, when and how much) but other components were not reported (e.g. where, who)) and 'Not reproducible' if there was not enough detail to satisfy a partially reproducible definition. This allowed an evaluation of overall reproducibility of each intervention as a whole to facilitate reporting and clearer interpretation. For the 'When and How much' criterion, the intervention details were extracted on how often the intervention was delivered, over what time period, number of sessions in total, duration, intensity, dose and volume. For the 'Tailoring', 'Modification', and 'How well' criteria, details were extracted for each (including what, when, why and how the intervention was tailored or modified during the study, how adherence or fidelity was assessed, by whom, and strategies to improve and the actual adherence or fidelity reported).

The outcomes were recorded as domains informed by the ICON health-related domains.[56] For completeness, we adopted the 24 candidate domains identified at stage one of the ICON Delphi process to fully map all domains reported in the included sources, rather than the nine core domains finally recommended by Vicenzino *et al.*[56]

All data were imported from the MS Excel spreadsheet and analysed in the R programming environment (v.4.1.2; R Core Team 2021).[57] A citation analysis was also conducted using citation, bibliographical, author and keyword information obtained from Scopus and Bibliometrix.[58]

Results

Description of included studies

The search identified 22,550 sources, of which 1994 were obtained in full text following deduplication and title and abstract screening. A further 1439 sources were excluded following full-text screening, leaving 548 studies from a total of 555 total sources, as seven studies were reported in more than one source. The main reasons for exclusion at full-text screening were wrong study design (n = 600, 42%), duplicate study (n = 351, 24%), wrong population (n = 150, 10%), wrong concept (n = 101, 7%) or not originating from a very highly developed country (n = 99, 7%) (see *Supplementary Material 1*). The study selection process is presented in *Figure 2* and a table of included studies is presented in *Table 33*, *Appendix 2*.

The 555 included sources comprised 119 (21%) systematic reviews and 436 (79%) primary studies. Sources were mostly published in English (n = 539; 97%), with 3% published in German (n = 6), Turkish (n = 5), Spanish (n = 3), Italian (n = 1) and Norwegian (n = 1). Automated translation was used for five sources, with the remainder being translated by colleagues of the review team. Assessment of the included studies' publication dates identified a consistent increase in the volume of research from 1998, reaching a peak of 50 studies published in 2019 and an average of 37 studies published each year between 2010 and 2019 (see *Figure 3*).

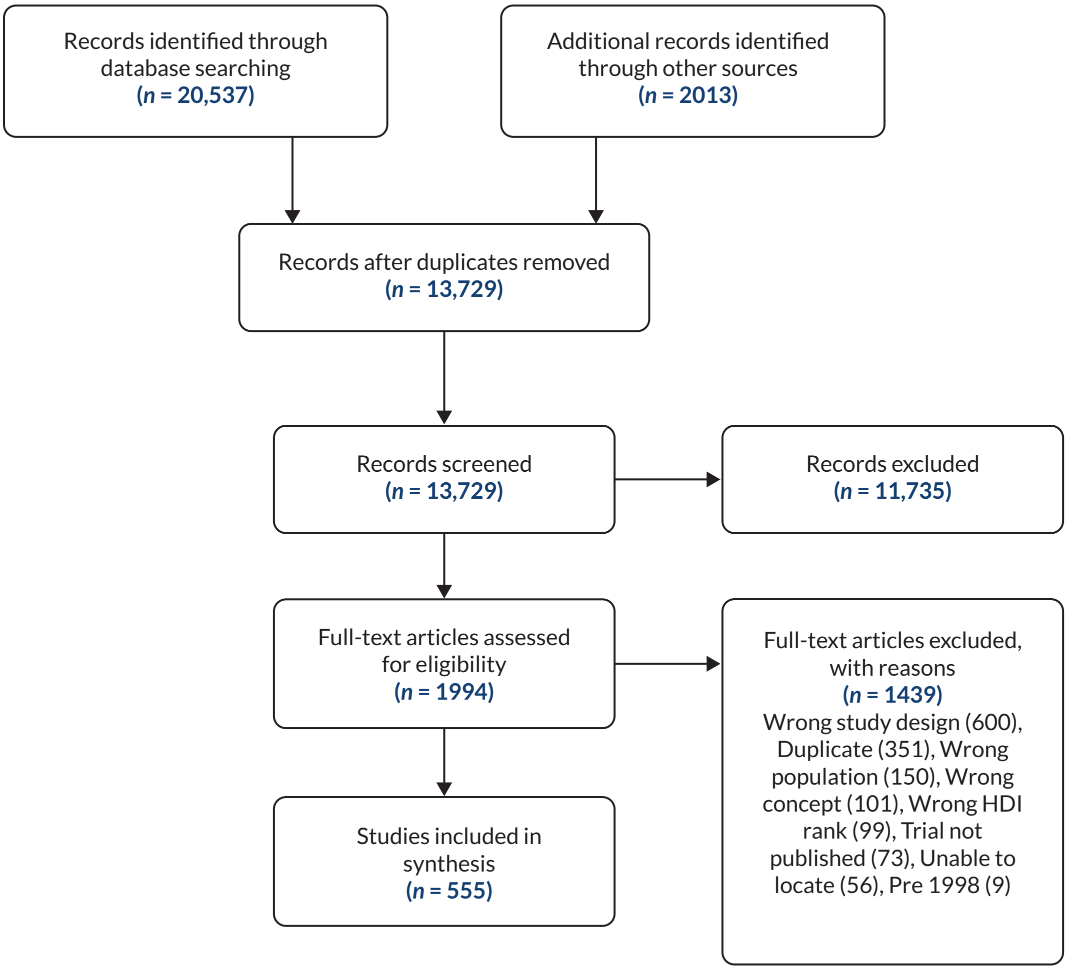

FIGURE 2 Study selection process – PRISMA flowchart.
From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al*. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. https://doi.org/10.1136/bmj.n71.

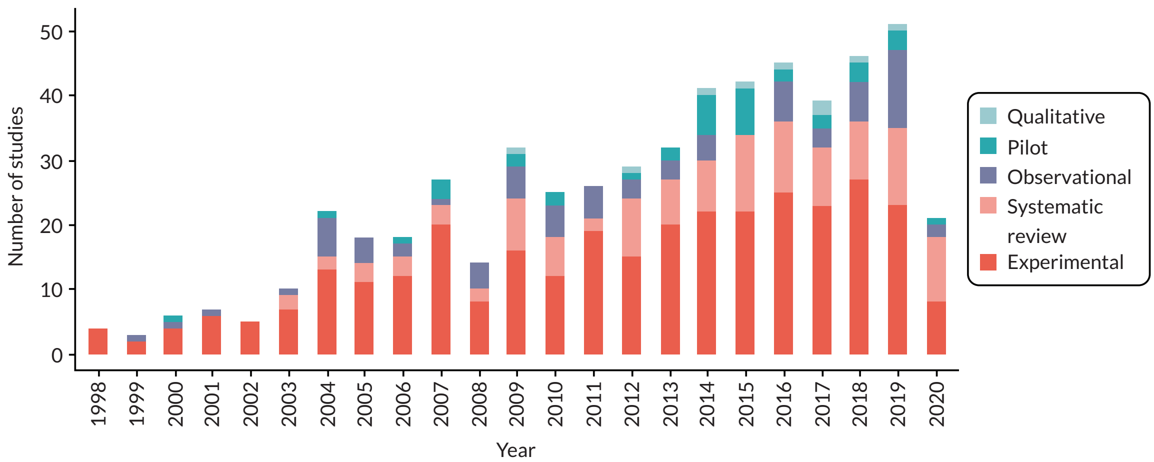

FIGURE 3 Number of included studies published over time and their study design.

Citation analysis

A citation analysis was conducted on the Scopus information obtained from 450 (81%) of the included sources, generating 14,860 references. The full citation analysis is available in *Appendix 3*. Of the 450 citations used to complete the analysis, they were published in: *British Journal of Sports Medicine* (*n* = 39, 9%), *American Journal of Sports Medicine* (*n* = 28, 6%), *Journal of Orthopaedic and Sports Physical Therapy* (*n* = 15, 3%), *Clinical Journal of Sports Medicine* (*n* = 14, 3%) and *Knee Surgery Sports Traumatology Arthroscopy* (*n* = 14, 3%). Based on citations per year, the top-ranked studies included De Vos *et al.* (49 citations per year),[59] Alfredson *et al.* (30 citations per year),[17] De Jonge *et al.* (21 citations per year),[60] Malliaras *et al.* (21 citations per year)[61] and Thanasas *et al.* (20 citations per year).[62] Across the 14,860 references identified, they were obtained from the *American Journal of Sports Medicine* (*n* = 655, 4%), *British Journal of Sports Medicine* (*n* = 628, 4%), *Journal of Orthopaedic Sports Physical Therapy* (*n* = 304, 2%) and *British Medical Journal* (*n* = 262, 2%). A country collaboration network diagram of the included references is available in *Appendix 3*, *Figure 23*, and illustrates extensive collaborations across many countries particularly the UK, USA and Australia. *Figure 24* (see *Appendix 3*) illustrates the rise in exercise for tendinopathy research from the early 1980s, reaching a peak in 2009.

Systematic reviews

There were 119 systematic reviews included in this scoping review. The reviews were classified by the review team as 72 (61%) systematic reviews without meta-analysis, 45 (37%) systematic reviews with meta-analysis and two (2%) umbrella/review of reviews. The number of studies included across the systematic reviews ranged from two to 84 with a median of 12 (IQR: 8–19). Four main tendinopathy types were the focus of the reviews, with 43 (36%) investigating RCRSP, 26 (22%) Achilles, 14 (12%) lateral elbow and 14 (12%) patellar tendinopathy. Five (4%) systematic reviews related to both Achilles and patellar tendinopathies, three (3%) focussed on gluteal or posterior tibial tendinopathies, two (2%) on hamstring or medial elbow tendinopathies and one (1%) on quadriceps. Most of the reviews were conducted by teams based in four countries: UK (*n* = 28; 23%), Australia (*n* = 17; 14%), USA (*n* = 14; 12%) and the Netherlands (*n* = 13, 11%). Exercise was the primary focus in 46 (38%) systematic reviews, a secondary focus (e.g. the control) in 49 (42%), and a neutral focus (i.e. equivalence between exercise and other interventions) in 24 (20%). Exercise was more commonly the primary focus of systematic reviews investigating lower-limb tendinopathy [Achilles (46%) and patellar (43%)), compared to upper-limb tendinopathy (RCRSP (34%) and lateral elbow (29%)].

The remainder of the results section and analysis relates only to the primary studies.

Primary studies

Study demographics

The predominant design for the 436 included primary studies was randomised controlled trial (RCT) (*n* = 236; 54%), followed by quasi-experimental (*n* = 81; 19%), observational (*n* = 75; 17%), pilot (*n* = 35; 8%) and qualitative (*n* = 9; 2%). The studies comprised information obtained from 25,490 participants (male = 10,463; female = 10,734), with study mean age ranging from 15 to 65 years. Most studies were conducted in a mixed setting (*n* = 116; 27%), with clinic (*n* = 91; 21%) and home settings (*n* = 61; 14%) also reported. A total of 31 countries were identified, with most studies conducted in four countries: Turkey (*n* = 60; 14%), USA (*n* = 48; 11%), UK (*n* = 43; 10%) and Australia (*n* = 32; 7%).

A range of additional participant characteristics were recorded across 362 studies (83%), with the most frequently reported characteristic being symptom duration (*n* = 253; 70%). Other less frequently reported characteristics included weight (*n* = 115; 32%), height (*n* = 113; 31%), affected side (including bilateral) (*n* = 105; 29%), body mass index (BMI) (*n* = 102; 28%), hand/limb dominance (*n* = 86; 24%), physical activity level (*n* = 82; 23%), employment status (*n* = 50; 14%), previous treatment (*n* = 34; 9%), number of physical activity sessions (hours of sport/week, mileage/week, or training/week) (*n* = 28; 7%), education level (*n* = 22; 6%), co-morbidities (*n* = 21; 6%), smoking status (*n* = 18; 5%), analgesic/nonsteroidal anti-inflammatory drug NSAID use (*n* = 16; 4%), mechanism of injury/causation (*n* = 15; 4%), previous history/episodes (*n* = 14; 4%), sports participation interference (*n* = 13; 4%), location of symptoms (*n* = 13; 4%), manual occupation (*n* = 11; 3%) and ethnicity (*n* = 9; 2%). Of the nine studies reporting ethnicity, European/Caucasian participants were included in all, with African American (four studies), Hispanic/Latino (three studies), Asian (one study) and Māori (one study) also reported. Sixty studies (17%) did not report any additional characteristics for participants.

Which tendinopathies were reported?

Four tendinopathy types accounted for over 90% of the results, with 167 (38%) studies focussing on RCRSP, 103 (23%) on Achilles, 82 (19%) on lateral elbow and 53 (12%) on patellar tendons. Less frequently investigated tendinopathies included gluteal, tibialis posterior and hamstring, which were the focus of 9 (2%), 7 (2%) and 3 (1%) studies, respectively. The breakdown of study design for the four most common tendinopathy types is illustrated in *Figure 4*. Experimental studies were the most commonly reported study design compared to the far smaller number of qualitative studies conducted across all the common tendinopathies.

Exercise interventions investigated

Exercise therapy interventions were reported as the primary focus of 161 (37%) studies, the secondary focus of 188 (43%) studies, and a neutral focus in 87 (20%) studies. The different exercise interventions were categorised as strengthening, flexibility (including dynamic range of motion (ROM) exercises), aerobic, proprioception or motor control and determined by the authors' stated purpose. A mapping of the different exercise intervention components and subcomponents across different tendinopathy types is presented in *Table 2*.

The most common exercise type reported across all tendinopathies was strengthening (84%), followed by flexibility (48%). When investigated individually, there were some differences in exercise types between different tendinopathies. All patellar tendinopathy studies (100%) reported the use of strengthening exercise, compared to 77–93% of studies for other tendinopathies. There was also greater use of aerobic exercise (17%) reported in patellar tendinopathy studies compared to other tendinopathies (0–13%).

While eccentric was the most common strengthening exercise reported for Achilles (89%), patellar (85%) and lateral elbow tendinopathy (44%), RCRSP studies reported isometric (21%) followed by a combination of eccentric and concentric (19%) as the most common. For flexibility exercise, upper-limb tendinopathies reported this more often (RCRSP 62%; lateral elbow 65%) than lower-limb tendinopathies (patellar 25%; Achilles 20%).

Flexibility exercise was poorly described across all tendinopathies, with 17% of studies not providing sufficient detail to categorise the type of flexibility exercise included. Where flexibility was well described, dynamic ROM was the most common form of flexibility exercise used for RCRSP (38%), with static sustained stretching most common for all other tendinopathies (6–37%). Motor control exercise interventions were mainly reported for RCRSP.

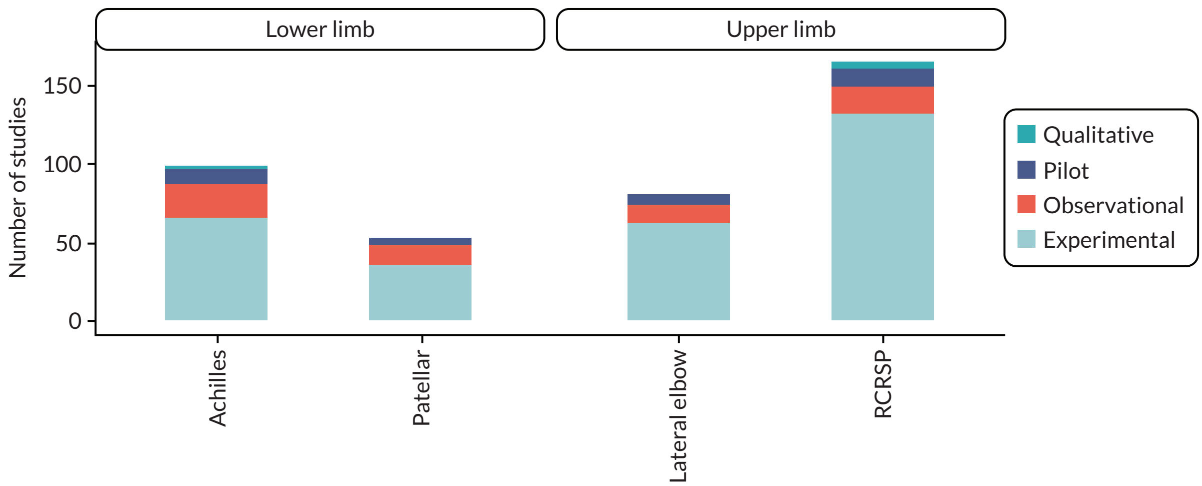

FIGURE 4 Primary study designs across main tendinopathy types.

TABLE 2 Exercise types reported across tendinopathies

	All (*n* = 436)	RC (*n* = 165)	Achilles (*n* = 99)	Lateral elbow (*n* = 81)	Patellar (*n* = 53)	Other (*n* = 38)
Strengthening	367 (84%)	128 (78%)	92 (93%)	62 (77%)	53 (100%)	32 (84%)
Eccentric	205 (47%;56%)	21 (13%;16%)	88 (89%;96%)	36 (44%;58%)	45 (85%;85%)	15 (39%;47%)
Concentric	37 (8%)	12 (7%)	4 (4%)	5 (6%)	9 (17%)	7 (18%)
Eccentric + Concentric	49 (11%;13%)	32 (19%;25%)	1 (1%;1%)	6 (7%;10%)	2 (4%;4%)	8 (21%;25%)
Isometric	68 (16%;19%)	34 (21%;27%)	5 (5%;5%)	11 (14%;18%)	10 (19%;19%)	8 (21%;25%)
Progressive strength	28 (6%;8%)	19 (12%;15%)	0 (0%;0%)	5 (6%;8%)	1 (2%;2%)	3 (8%;9%)
Isotonic	15 (3%;4%)	11 (7%;9%)	1 (1%;1%)	2 (2%;3%)	1 (2%;2%)	0 (0%;0%)
Isokinetic	17 (4%;5%)	6 (4%;5%)	1 (1%;1%)	1 (1%;2%)	3 (6%;6%)	6 (16%;19%)
HSRT	4 (1%;1%)	0 (0%;0%)	0 (0%;0%)	1 (1%;2%)	3 (6%;6%)	0 (0%;0%)
Plyometric	12 (3%3%)	2 (1%;2%)	4 (4%4%)	3 (4%;5%)	1 (2%;2%)	2 (5%;6%)
Flexibility	208 (48%)	103 (62%)	20 (20%)	53 (65%)	14 (26%)	18 (47%)
Traditional stretching	95 (22%;46%)	42 (25%;41%)	6 (6%;30%)	30 (37%;57%)	6 (11%;43%)	11 (29%;61%)
Dynamic ROM	72 (17%;35%)	63 (38%;61%)	0 (0%;0%)	5 (6%;9%)	1 (2%;7%)	3 (8%;17%)
PNF	14 (3%;7%)	8 (5%;8%)	0 (0%;0%)	4 (5%;8%)	0 (0%;0%)	2 (5%;11%)
No detail	75 (17%;36%)	32 (19%;31%)	12 (12%;60%)	17 (21%;32%)	7 (13%;50%)	7 (18%;39%)
Proprioception	21 (5%)	10 (6%)	2 (2%)	2 (2%)	2 (4%)	5 (13%)
Motor control	73 (17%)	66 (40%)	0 (0%)	1 (1%)	1 (2%)	5 (13%)
Aerobic	24 (6%)	4 (2%)	6 (6%)	0 (0%)	9 (17%)	5 (13%)

HSRT, heavy slow resistance training; PNF, proprioceptive neuromuscular facilitation; Traditional stretching, static and sustained hold; %, percentage of column total; (%;%), percentage of column total and percentage of strengthening/flexibility total.

Exercise intervention reporting

All exercise interventions were mapped to the TIDieR checklist[55] and are presented for all tendinopathies in *Figure 5* and for the four main tendinopathies in *Figure 6*. The intervention setting was often not reported (51%) or only partially reported (19%). Additionally, over one-third of studies did not report the how (mode of delivery, 38%), who (intervention provider expertise, 37%), why (rationale, theory, or goal, 36%) or what (physical or informational materials used, 35%) components of interventions. Data from the TIDieR checklist were used by the review team to categorise study interventions as fully reproducible (all details reported to enable reproduction of the exercise), partially reproducible (some but not all details of exercise reported to enable partial reproduction of the exercise) or not reproducible (see *Figures 5* and *6*). Reproducibility was assessed across different tendinopathies, with most exercise interventions (56–74%) categorised as partially reproducible, and only a minority (4–15%) categorised as fully reproducible.

Monitoring exercise adherence was planned by authors in 152 studies and the main method consisted of exercise diaries (71% of reported methods). Other methods included summary records from therapist (8%), self-report (7%), therapist individual session records (6%), follow-up phone calls to monitor attendance (4%), follow-up appointments to monitor adherence (3%) and adherence reported by family member (1%). Whilst exercise adherence was planned in 152 studies, adherence data were only reported in 89 (59%) of those studies, representing 20% of all primary studies in the review.

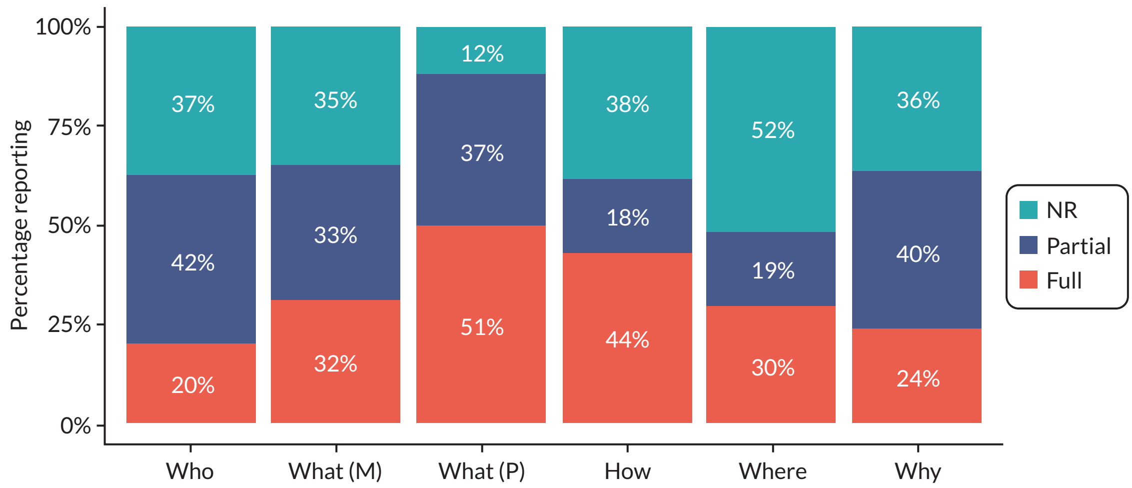

FIGURE 5 Exercise therapy reporting across all tendinopathy types using the TIDieR checklist.
Who: intervention provider expertise; What(M): informational materials used; What(P): physical materials used; How: mode of delivery; Where: intervention setting; Why: rationale, theory or goal; NR: not reported; Partial: partially reported; Full: fully reported; Other: refers to all other tendinopathy types.

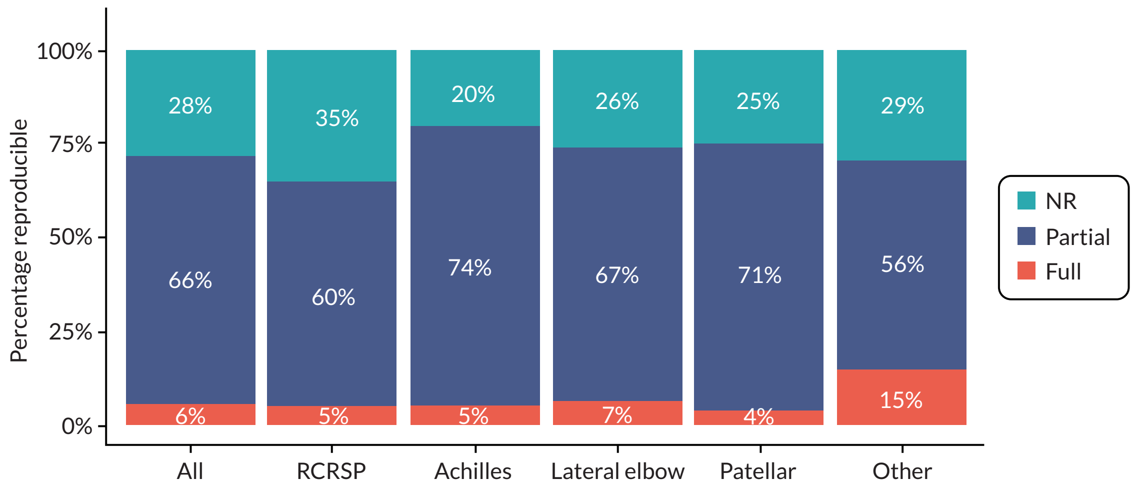

FIGURE 6 Reproducibility of exercise therapies across tendinopathy types using the TIDieR checklist.
NR: not reported; Partial: partially reported; Full: fully reported; Other: refers to all other tendinopathy types.

Reported adherence means ranged from 16% to 100% in individual studies and were 77% across all studies. Authors used varied grading of adherence from subjective terms such as 'high', 'good' and 'adherent' to aligning frequencies to rankings of poor to excellent (e.g. >75% 'good', 70% 'good/excellent', 25–75% 'moderate to excellent', 50% 'good', 27% 'moderate to poor'). Studies also reported a reduction in adherence over time with 12-week adherence ranging from 27% to 94.2% and two-year adherence ranging from 41% to 87.4%.

Reporting of modifications (any modifications to the intervention during the study) and tailoring (planned personalisation, titration or adaptations) of exercise interventions were also recorded. Tailoring was reported in 247 (56%) studies and involved personalised progression of exercise interventions via increasing: sets, number of sessions per day, repetitions, resistance/load, speed, duration of muscle contraction, time spent on exercise, ROM, difficulty (up to 13–15 rating of perceived exertion), addition of new exercises, reducing base of support/stability, gradual increase in other physical and sporting activities, and progression from low to higher impact activities. Progressions were determined by the physiotherapist/exercise professional, improved quality of movement control, full range of movement, ratings of participant-perceived effort (e.g. less than 7, up to 11–14), fatigue, the absence of pain, pain rated as no more than 3–5/10 on a pain scale, or as 'pain allowed'.

Tailoring also involved decrements in exercise via reduced loading and ROM due to participant-reported pain, typically including pain greater than 4–5/10 on a visual or verbal analogue scale or pain that did not rapidly subside (e.g. within 10–15 minutes post exercise). Modifications were reported in only 20 (5%) studies. Modifications included participants being withdrawn and referred for further investigation, follow-up appointments as required to facilitate self-management or for any difficulties, and alternative planes of motion or training technique modifications that were more comfortable for participants or due to additional musculoskeletal problems occurring during the study.

Exercise therapy adjuncts

Treatment adjuncts (non-exercise treatments in addition to the exercise component of interventions) were included in 140 studies (44%) and were not present in 109 (67 were not applicable due to study design). The main treatment adjuncts were injection, laser, ESWT, manual therapy (MT) and splinting/taping. Additionally, of the 316 experimental studies included, 49 (16%) included a specific non-exercise arm (whereby one or more of the groups were not prescribed any exercise as part of their intervention) whilst 184 did not include a non-exercise arm (83 were not applicable).

Health domains

To answer the second review question on what outcomes have been reported, outcomes were broken down into health domains and the outcome measurement tools used for each domain. Primary and secondary health domains were extracted across all tendinopathy types and are presented in *Table 3*. Disability was the most common primary health domain (*n* = 282) for RCRSP (*n* = 123), Achilles (*n* = 67) and patellar (*n* = 40) tendinopathies (see *Table 2*). For lateral elbow, physical function capacity (PFC) was most common (*n* = 40). Secondary health domains also varied across tendinopathies, with Achilles and patellar both reporting participant rating of overall condition most frequently (*n* = 15 and *n* = 8 respectively), with disability the most common secondary domain for RCRSP (*n* = 27), and PFC (*n* = 14) for lateral elbow. Across tendinopathies, adverse effects or cost effectiveness were rarely the primary or secondary outcome.

Outcome measurement tools

An extensive range of primary and secondary outcome tools were reported across tendinopathies. A comprehensive map of the tools relative to health domains and tendinopathy types is provided here:
Primary outcomes: http://www2.rgu.ac.uk/nhir/tendinopathy-primary-outcomes-interactive-table.html
Secondary outcomes: http://www2.rgu.ac.uk/nhir/tendinopathy-secondary-outcomes-interactive-table.html. The most frequently reported tools included visual analogue scales (VAS) (RCRSP *n* = 73, lateral elbow *n* = 44, Achilles *n* = 29, patellar *n* = 22); Victorian Institute of Sport Assessment questionnaires (Achilles VISA-A *n* = 59, patellar VISA-P *n* = 39); Shoulder Pain and Disability Index (SPADI) (RCRSP *n* = 45); dynamometer (lateral elbow *n* = 39, RCRSP *n* = 17); Goniometer (RCRSP *n* = 39); Constant Murley Score (CMS) (RCRSP *n* = 36); Disabilities of the Arm, Shoulder and Hand questionnaire (DASH/Quick DASH) (RCRSP *n* = 35); ultrasonography (Achilles *n* = 20, patellar *n* = 11); patient-rated tennis elbow evaluation questionnaire (lateral elbow *n* = 17) and numerical pain rating scale (NPRS) (RCRSP *n* = 14).

The main secondary outcome tools were dynamometer (lateral elbow *n* = 15, RCRSP *n* = 13), VAS (RCRSP *n* = 15, Achilles *n* = 10, lateral elbow *n* = 8, patellar *n* = 8), NPRS (RCRSP *n* = 13, Achilles *n* = 5), ultrasonography (Achilles *n* = 11), goniometer (RCRSP *n* = 9), DASH (RCRSP *n* = 8), 36-item short-form survey (SF-36) (RCRSP *n* = 7), EQ-5D (gluteal *n* = 6), CMS (RCRSP *n* = 6), Western Ontario Rotator Cuff Index (RCRSP *n* = 6) and algometer (lateral elbow *n* = 5).

Of the nine qualitative studies included, the majority were on RCRSP (five studies) followed by Achilles (*n* = 2), tibialis posterior (*n* = 1) and a mixed tendinopathy group (*n* = 1: Achilles/patellar/RCRSP).

TABLE 3 Instances of primary and secondary health domains reported according to tendinopathy type

ICON domain Description (where required)	Primary or secondary outcome	All (*n* = 436)	RC (*n* = 165)	Achilles (*n* = 99)	Lateral elbow (*n* = 81)	Patellar (*n* = 53)	Other (*n* = 38)
Adverse effects/events Unintended treatment effect	Primary	11	1	6	1	2	1
	Secondary	13	4	2	2	5	0
Clinical examination findings e.g. clinical examination tests	Primary	19	10	1	2	0	6
	Secondary	6	5	0	1	0	0
Disability Composite scores of patient-rated pain and disability due to pain, usually tendon-specific	Primary	282	123	67	35	40	17
	Secondary	53	27	5	11	6	4
Drop out or discontinued treatment	Primary	7	1	1	3	2	0
	Secondary	0	0	0	0	0	0
Economic impact costs	Primary	4	3	0	1	0	0
	Secondary	2	1	0	1	0	0
Function Patient-rated – not referring to pain intensity	Primary	21	7	1	7	2	4
	Secondary	13	6	3	2	0	2
Medication use	Primary	9	2	4	2	1	0
	Secondary	10	5	0	2	3	0
Other	Primary	24	6	8	7	3	0
	Secondary	17	5	6	3	2	1
Pain – clinician-applied stress/examination	Primary	8	1	1	4	1	1
	Secondary	5	0	1	3	1	0
Pain on loading/activity Pain during tendon-specific provocation	Primary	108	42	21	18	21	6
	Secondary	34	18	5	5	6	0
Pain over a specified time Pain intensity over e.g. 24 hours, 7 days	Primary	63	30	5	19	4	5
	Secondary	38	21	6	8	2	1

continued

TABLE 3 Instances of primary and secondary health domains reported according to tendinopathy type *(continued)*

ICON domain Description (where required)	Primary or secondary outcome	All (*n* = 436)	RC (*n* = 165)	Achilles (*n* = 99)	Lateral elbow (*n* = 81)	Patellar (*n* = 53)	Other (*n* = 38)
Pain without further specification Pain without reference to specified time or activity	Primary	90	41	13	18	10	8
	Secondary	16	5	4	3	2	2
Palpation	Primary	9	0	4	2	2	1
	Secondary	1	0	1	0	0	0
Participant/patient rating overall condition Single numerical assessment	Primary	66	15	20	17	8	6
	Secondary	46	13	15	6	8	4
Participation Patient rating e.g. level of/return to sport	Primary	25	8	6	5	4	2
	Secondary	18	8	5	3	2	0
Physical activity Self-report or wearables	Primary	6	0	5	0	0	1
	Secondary	4	0	2	0	0	2
PFC Physical tasks e.g. hops, squat tests	Primary	100	30	13	40	8	9
	Secondary	44	18	7	14	4	1
Psychological factors e.g. self-efficacy, kinesiophobia	Primary	5	4	1	0	0	0
	Secondary	9	5	2	0	0	2
QoL General well-being	Primary	17	10	3	4	0	0
	Secondary	26	11	3	7	2	3
ROM	Primary	56	44	3	4	1	4
	Secondary	18	14	3	1	0	0
Sensory modality specific pain e.g. quantitative sensory testing	Primary	11	3	3	4	1	0
	Secondary	6	1	1	4	0	0
Structure (tendon tissue characteristics) e.g. imaging/biopsy	Primary	56	9	32	4	10	1
	Secondary	18	5	10	1	2	0

These studies represented 114 participants (people with tendinopathy and physiotherapists), of whom 59 were female and 36 male. The studies reported participants' barriers and facilitators to exercise interventions, which included psychosocial impact, treatment burden, motivation, confidence, coping, pain, socialisation, and benefits of group exercise, recognising the challenges of exercise interventions and self-management. They also reported on a range of physiotherapist-related factors including views, clinical reasoning, perceived barriers and facilitators, and treatment awareness.

Discussion

This is the first scoping review to comprehensively map existing evidence on exercise therapy interventions and outcomes for the treatment of tendinopathies. A total of 555 sources were included, demonstrating the abundance of research, the need for it to have been mapped in this review, and also the need for a taxonomy of exercise interventions and reporting standards to allow comparisons of efficacy to be made. This review guided the subsequent contingent evidence syntheses reported in *Chapters 5* and *6*. It also identified research gaps which can inform future research and evidence syntheses. Finally, the review identified potential areas of improvement in clinical practice which will need to be explored further.

Although the number of RCTs in this field has increased recently, there were large numbers of quasi-experimental and observational studies identified by this review. The mapping of all these study designs directly informed the efficacy reviews reported in *Chapter 5*.

This review also identified a small number of qualitative studies which can contribute to understanding feasibility and acceptability of exercise for tendinopathy. These are reported, along with relevant quantitative designs exploring these phenomena, in the mixed-method review reported in *Chapter 6*. The small number of qualitative studies identified, compared with the volume of quantitative research, identifies a need for further primary research to fully understand patients' and practitioners' perceptions and experiences of exercise therapy interventions for tendinopathy in order to guide intervention development and assist with real-world implementation of findings from trials.

Exercise for tendinopathy

The findings that strengthening exercise was the most reported exercise type across all tendinopathies, particularly the lower limb, and that eccentric strengthening exercise was most common for three tendinopathies (Achilles, patellar, lateral elbow) are in keeping with previous evidence.[63] However, due to the variable levels of reporting, it would be difficult to determine whether many interventions described as strengthening would in fact achieve the required overload for strengthening to occur. This has implications for practice, and improved quality of reporting of exercise interventions in future studies is urgently required, along with better clarity about the definitions of terms such as 'strength' compared to 'muscle activation' or 'endurance exercise'.

The findings related to RCRSP demonstrated the most clinical heterogeneity, with greater variation in strengthening exercise type, and exercise type per se, with flexibility, motor control and proprioceptive exercise reported in addition to strengthening. Dynamic ROM exercise for flexibility was more frequently reported than traditional active or passive stretching for RCRSP. This varied approach to the management of RCRSP suggests that there is, as yet, no consensus in the literature on how best to manage this complex tendinopathy.[64,65]

Reporting of interventions was highly variable, with the TIDieR checklist classifying 15% or fewer included interventions as fully reproducible. This finding has implications for practice, as it would be challenging, if not impossible, for practitioners to adopt interventions demonstrated as efficacious in research studies, possibly resulting in suboptimal exercise prescription and patient outcomes. This identification of variable and typically inadequate reporting further supports the need for the development of minimum standards of reporting, using available guidelines such as TIDieR to assist the process.[66,67]

Only 20% of included primary studies reported adherence, despite the planned intention to collect adherence measures in 35% of studies, which is similar to previous adherence reports three decades ago.[68] Adherence monitoring relied primarily on a range of participant self-report instruments with wide variation in scoring methods, and a lack of objective monitoring. These issues are further explored in *Chapter 6* (mixed-method review of feasibility and acceptability).

Around half of the studies included personalised tailoring of exercise guided by pain, in keeping with the evidence that adherence to interventions that require exercising into or through pain (e.g. Alfredson protocol) will typically be lower.[69] The small body of included qualitative studies suggest that there may be several barriers to adherence (e.g. treatment burden, pain, psychosocial factors, motivation, confidence and coping). These are likewise further explored in *Chapter 6*.

Proposed initial reporting criteria for exercise interventions for the management of tendinopathy

Having mapped the exercise interventions on the management of tendinopathy, the review team produced initial criteria to inform the reporting of tendinopathy exercise interventions to ensure consistency and allow easier comparisons in the future. The proposed initial criteria (see *Box 1*) combined the results from the mapping of the type of exercise interventions during the scoping review and the recommendations in the TIDieR checklist. The initial reporting criteria identified in this scoping review require further funding and development with all relevant stakeholders to create a comprehensive taxonomy to guide exercise reporting in tendinopathy practice and research.

Including information on the place and method of delivery of exercise interventions is important to allow cost-effectiveness analyses. The increasing delivery of medical interventions remotely or in group settings presents opportunities for efficiencies, but currently there is lack of evidence on the cost-effectiveness of such approaches.

BOX 1 Proposed initial reporting criteria for reporting exercise for tendinopathy

Information to be collected

- Anatomical location of tendinopathy (e.g. RCRSP)
- Exercise therapy class/treatment
  - Dominant therapy class (e.g. strength/resistance)
    - Exercise treatment (e.g. eccentric exercise)
  - Complete therapy class (e.g. strength/resistance + flexibility + proprioception)
    - Complete exercise treatment (e.g. eccentric exercise + static stretching + movement pattern retraining)
- Exercise dose
  - Intensity (e.g. load (kg))
  - Volume (e.g. sets × repetitions)
  - Frequency (e.g. number of times per week)
  - Duration (length of time intervention delivered)
- Non-exercise intervention class (e.g. electro-therapy)
  - Intervention (e.g. Shockwave) and delivery information
- Intervention delivery
  - Intervention setting (e.g. primary/secondary care)
  - Delivered by whom (e.g. physiotherapist)
  - Delivered how (e.g. supervised one-to-one)
- Exercise fidelity and adherence
  - Exercise fidelity and adherence measures used (e.g. proportion of exercise sessions completed)
  - Exercise attendance data (e.g. attendance [the number of sessions attended over the follow-up period])
  - Participant responsiveness (e.g. self-report of how far participants respond to, or are engaged by, an intervention)
- Outcome domain – primary and secondary (e.g. disability)
  - Outcome measurement tools for primary and secondary domains (e.g. SPADI)
- Demographic information
  - Patient characteristics (e.g. age, BMI, sex, ethnicity, activity levels, comorbidities, occupation)
  - Symptom duration

Reporting of participant characteristics

Reporting of participant demographics was also highly variable across studies, with very low reporting rates for some potentially important comorbidities and confounders such as age, gender, cardiovascular conditions, diabetes and non-Caucasian ethnicities. For example, low- to moderate-quality evidence has demonstrated a link between metabolic syndrome, obesity and RCRSP but this was not well reported in studies.[70] This has limited the ability to pool findings, evident in the small number of previous systematic reviews that have conducted meta-analyses. This limitation also influenced the meta-analyses that could be conducted in the efficacy reviews presented in *Chapter 5*. There is therefore an urgent need for full and transparent reporting of patient characteristics in tendinopathy research[66,71,72] and to continue the development of the ICON standards for such reporting.[73] The wide age range reported across included studies and the lack of reporting of co-morbidities (particularly in older populations) lend support to demographic sub-grouping of participants to lessen the impact of confounders and to identify different responses to exercise across groups.

Outcomes

The finding that numerous primary (n = 335) and secondary (n = 194) outcomes were reported across a range of 22 health domains highlights the lack of consensus to date on outcome measurement for tendinopathy. The work of the ICON group led by Vicenzino *et al.*[56] demonstrates that there is a difference between outcomes reported in the evidence base and those currently recommended. For example, ROM was the second most commonly reported domain for RCRSP yet it is not considered a core domain by ICON.[56] Of the six core ICON domains agreed on by healthcare professionals and patients, only two (rating of condition and PFC) were reported as primary or secondary domains in this review. This may reflect the differences between researchers' focus and what health professionals and patients feel are important in practice,[56] also indicated by low reporting of quality-of-life outcomes. Adverse events and cost-effectiveness outcomes were also rarely reported.

Numerous outcome measurement tools were used across each health domain, highlighting the need for core outcome sets to be agreed for both research and practice. The ongoing international work on developing core outcome sets for Achilles, gluteal, lateral elbow and proximal hamstring tendinopathies[74–77] and shoulder disorders[78] will enhance standardisation of outcomes and enable future pooling of findings in systematic reviews. Outcomes reported for RCRSP in this review were not congruent with the core set endorsed by the Outcome Measures in Rheumatoid Arthritis Clinical Trials (OMERACT) network;[78] only pain was common to both OMERACT and this review. The health domains and outcome measures identified in this scoping review informed the domains that could be included in the efficacy reviews (*Chapter 5*).

The finding that physical outcomes (e.g. pain, disability) were dominant, with infrequent reporting of psychosocial outcomes (e.g. psychological factors), conflicts with clinical tendinopathy management, where the long duration and impact on peoples' lives mean that those more severely affected may experience more fear avoidance, kinesiophobia, anxiety and depression.[79,80] This finding further emphasises the need for qualitative research, and the use of more holistic, patient-centred outcomes in tendinopathy research.[81,82] This scoping review clearly demonstrates that research to date is skewed towards physical interventions and outcomes and has neglected the social and psychological aspects of presentation and management.

Limitations

There are some inevitable limitations to this scoping review. We were unable to locate 56 articles. The use of the HDI[54] ensured that the international evidence gathered is compatible with the UK context; however, it is possible that some pertinent evidence may have been excluded as a result. Nonetheless, we are confident that including studies from countries ranked as having lower HDI would not significantly affect the results of this review, as a comprehensive search was conducted and translations were sourced for all included non-English-language studies. It should also be noted that this scoping review has comprehensively mapped what has been conducted in the field of research. Although practice is informed by the evidence base, there are well-documented evidence-practice gaps,[83] and it is therefore not known to what extent the findings represent what is done in the practice setting.

Conclusions

This scoping review provides the first comprehensive map of exercise therapy interventions and outcomes for tendinopathy research. Several important recommendations for future research and its reporting have emerged from this review, and are itemised below. Practice recommendations are limited from scoping reviews, due to the lack of methodological quality assessment of included studies. The results from this scoping review directly informed the remainder of this body of work, reported in *Chapters 5* and *6*.

Recommendations for research

Research study types

a. There is a need for adequately powered and methodologically sound studies that can truly demonstrate the effectiveness of interventions.
b. To achieve (a) we recommend that intervention development studies are conducted prior to moving to adequately powered trials, including feasibility and acceptability studies. Qualitative studies (standalone or embedded within other designs) should explore participants' perceptions and experiences of exercise for tendinopathy. There is an urgent need for cost-effectiveness analyses and for studies on the implementation of effective interventions in practice.
c. Future evidence synthesis should focus on conducting high-quality systematic reviews (such as quantitative, qualitative, mixed-method and cost-effectiveness) and combining high-quality reviews into umbrella reviews. For these to add meaningful findings, there is an urgent need for further high-quality primary studies that address the limitations identified in this review.

Research reporting

a. The description of exercise interventions for tendinopathy needs to follow minimum standards to ensure consistency and allow comparisons. For this purpose, the initial reporting criteria proposed by this review could be helpful but require further development and investment to create a comprehensive taxonomy and guidance.
b. Full reporting of participant characteristics including psychological factors, ethnicity, co-morbidities and activity level is required in future tendinopathy research.
c. Future research should consider sub-groups such as those based on gender age, sedentary/active/performance populations and ethnicity.
d. Future research should apply the ICON core health domains to ensure collection and reporting of all relevant biopsychosocial outcomes.
e. Future research should carefully consider adequate monitoring and reporting of adherence to exercise. This will require refinement of data-collection methods, and we recommend considering objective monitoring.

Patient and practitioner lived experience

a. There is a need for research on participants' views and experiences of exercise interventions across tendinopathies and populations. There is also a need for research on practitioners' views of management approaches for different tendinopathies, how to navigate the research-practice gap and address barriers to exercise intervention implementation.

Stakeholder engagement with scoping review findings

Two workshops were initially planned to be held in Aberdeen and London to discuss the results of the scoping review with people who had received exercise for tendinopathy, people who manage tendinopathy and academics/researchers with an interest in tendinopathy. The outcome from the workshops was intended to inform the conduct of the subsequent contingent reviews conducted in phase 2 of this body of work. The impact of COVID-19 led to the workshops occurring online via Microsoft Teams in September–October 2020. One workshop was held with people who had experience of receiving exercise as a treatment for tendinopathy and one with people involved in tendinopathy management and/or research.

Following initial introductions and an overview of the scoping review results, the workshops were designed to:

i) consult with stakeholders on what information they would like the project to provide, and
ii) discuss what stakeholders thought the findings were saying, what was of interest to them, and discussing their thoughts on what the subsequent syntheses should focus on.

Participants were recruited via social media (including Twitter and Facebook accounts for the project and the project team members' personal accounts, Council for Allied Health Professions Research Twitter, Robert Gordon University [RGU] School of Health Sciences Twitter and Facebook accounts), RGU volunteer patient group, NHS Grampian physiotherapy staff email, NHS Grampian Involve Facebook page, and snowball recruitment via word of mouth and through personal and professional contacts of the review team.

Nine people who deliver exercise therapy for tendinopathy or have an academic or research interest in the topic attended the first workshop. This represented four physiotherapists (from the NHS, sportscotland institute of sport and private practice), one podiatrist, two PhD students focussed on RCRSP and patellar tendinopathy, and two physical preparation coaches. There were five female and four male professionals. Four females with experience of exercise therapy for tendinopathy attended the second workshop. They had experience of RCRSP (n = 2) and recurrent patellar tendinopathy (n = 1), with one identifying as a high-performance athlete.

To augment the workshop findings, a short online survey (incorporating the same questions used in the workshops) was distributed via Jisc online surveys using the same recruitment methods as for the workshops, with emphasis on the review team's professional networks. This enabled the views of non-UK-based clinicians and researchers to be considered, as they could provide feedback in an asynchronous manner. Twenty-six survey responses were obtained and the findings were combined with those from the workshops. We did not obtain demographic details of workshop or survey participants. They represented a convenience sample of people willing to engage with the review team and can therefore not be considered representative of the lay, clinical or scientific population. Nonetheless, their contribution was helpful in refining the direction of the project.

The outcome of the workshops and survey identified what was important to stakeholders and can be summarised as follows:

People with experience of exercise for tendinopathy

- wanted to know what type of exercise they should do, at what dosage and how hard they should push themselves
- said that key factors to consider in the exercise intervention include self-management, trust in the professional delivering the exercise, being motivated by the professional delivering the exercise, monitoring of exercise and individually tailored prescription of exercise

- told us that important treatment outcomes are pain, function and sleep: the last-named particularly for people with RCRSP.

Exercise for tendinopathy practitioners/researchers

- were interested in how the scoping review data could be used as a resource
- wanted exercise guidance for tendinopathy subgroups (including different populations, tendons, exercise types, co-morbidities, BMI, age, gender)
- wanted clear clinical messages for specific exercises that work
- for those working with performance athletes, they wanted to know how hard to push into pain (guidance for the 'sweet spot')
- wanted progression guides for active and sedentary populations
- recommended the following to be considered in the contingent syntheses

    - age and chronicity-related subgroups
    - performance- related outcomes such as training load, rating of perceived exertion, training duration, activity tracking using global positioning system (GPS) or heart rate data
    - general population (NHS patients) outcomes should include QoL, return to previous activity, global rating of change, patient acceptance of symptoms, expectations for improvement, and sleep (especially gluteal and RCRSP)
    - analysis of exercise intensity, volume, frequency, and training progression
    - rating the quality of interventions
    - effect of adjunct therapies
    - adherence and supervision.

The workshops and survey therefore provided insight into what was considered important by people with tendinopathy and people who manage tendinopathy. We gave due consideration to all suggestions, some of which could be taken forward in the contingent syntheses, and some of which we were unable to consider, due to the nature of the available research. We have further workshops planned to assist with dissemination of the contingent review findings.

Chapter 5 Phase II: Contingent synthesis 1: efficacy of exercise therapy for the management of tendinopathy

Contingent synthesis 1 summary

This part of the evidence synthesis investigated the efficacy of exercise therapy for the management of tendinopathies. The contingent synthesis sought to quantify efficacy of exercise therapies and address review questions 3 (Which exercise interventions are most effective across all tendinopathies?) and 4 (Does type/location of tendinopathy or other specific covariates affect which are the most effective exercise therapies?) of the project. To address these questions, a series of large meta-analysis models were conducted employing ‘effectiveness review’ methodologies.

The review was split into three sections, with the first (efficacy review 1) quantifying efficacy through calculation of a range of effect sizes from exercise-only interventions. Sections 2 and 3 investigated comparative efficacy. A hierarchical approach was used to categorise interventions so that comparisons could be made. Interventions were initially categorised according to their therapy class. The broadest categorisation of therapy classes comprised demarcations including exercise, non-exercise and non-active. More specific therapy classes further partitioned these categories (e.g. exercise to: resistance, flexibility and proprioception). Interventions were then categorised according to their therapy treatment (e.g. eccentric-only, static stretching and joint position sense). Interventions frequently comprised multiple therapy classes and multiple therapy treatments. Where this was the case, the dominant therapy class and treatment based on the relative contributions and/or the focus of the study was identified.

In the second section of this review (efficacy review 2), comparative efficacy was assessed between different exercise therapies based on their dominant therapy class and their dominant therapy treatment. In the third section of this review (efficacy review 3), comparative efficacy was assessed between exercise-only therapies, non-exercise therapies (e.g. surgery, injection, and MT) and combined therapies to quantify comparative efficacy across a range of therapy classes frequently used in the management of tendinopathy.

A total of 204 studies comprising 467 TAs and 12,081 participants were identified that met the inclusion criteria to be included in at least one section of the review. Additionally, a total of 125 studies were identified featuring 188 TAs that comprised exercise-only therapies. Efficacy review 1 identified that, in general, exercise-only therapies can be considered efficacious across the most common tendinopathy locations and outcome domains measured. Whilst large variation in response to exercise-only therapies can be expected, in general, substantive improvements are frequently reported based on standardised changes from baseline measurements. Analyses identified consistency in improvements across RCRSP, Achilles, patellar and lateral elbow tendinopathies. However, substantive differences were identified across outcome domains, with QoL and objective outcomes including ROM and physical functional capacity demonstrating smaller relative improvements compared with subjective outcomes measuring disability, function and pain. In addition, exercise-only therapies were found to generate low numbers of adverse events and scored well on patient rating outcomes, with most patients reporting they were satisfied and perceived moderate to strong recovery. Resistance exercise was used more frequently than any other exercise class and analyses demonstrated dose-response relationships corresponding with perspectives of the importance of higher mechanical loads. Evidence was obtained to indicate less frequent loading with greater resistance is more efficacious, particularly with tendinopathies of the lower body. However, review of the resistance exercise therapies identified that most were likely to employ relatively low resistances and instead focus on high frequencies.

In efficacy review 2, analyses were conducted on 21 studies comparing different classes of exercise-only therapy, and 34 studies comparing different exercise-only treatments. Separate analyses were conducted across different outcome domains and tendinopathy locations where possible. Low-quality evidence was obtained for a small but consistent increase in efficacy where flexibility was the dominant class of exercise therapy. Most of the research contributing to these comparisons was obtained for the shoulder, where the pathoetiology is multifactorial and guidelines for therapies often focus on flexibility and proprioceptive exercises. When investigating dominant treatments, most of the available data compared therapies comprising different resistance contraction modes, with the most popular being eccentric-only. Evidence was obtained indicating that eccentric-only therapies were superior to concentric-only or isometric therapies; however, evidence was also obtained indicating that the combination of eccentric and concentric actions was superior to eccentric-only. These results may be influenced by the findings in efficacy review 1 highlighting that most resistance exercise therapies are unlikely to apply substantive loads and therefore any potential benefits of the potential to apply higher load during eccentric actions may not be realised.

In efficacy review 3, analyses were conducted on 201 studies, with comparisons made between broad therapy classifications and dominant classes of therapy. Analyses were pooled across all tendinopathy locations and separated according to outcome domain. The single most popular class was resistance exercise, followed by electro-therapy, flexibility, injections and MT. Inconsistent results were obtained when comparing dominant classes across outcome domains. As a result, no hierarchy of therapy class could be created. Broad comparisons of therapy classifications comparing exercise-only, non-exercise-only and combined therapies identified that combining exercise and non-exercise therapies appeared more efficacious. Further analyses identified that the strongest evidence was obtained for combining exercise with either electro-therapy, injections or kinetics (e.g. immobilisation or altered loading through taping and braces).

Overarching methods

Search strategy

The comprehensive search strategy for this review comprised: (1) identifying potentially relevant systematic reviews, RCTs and quasi-experimental trials from the original search conducted for the scoping synthesis (see *Chapter 4*); (2) obtaining all references and citations from the 130 systematic reviews and 317 primary studies (236 RCTs and 81 quasi-experimental trials) using Scopus and hand-searching and adding to the overall search results for screening; (3) updating the original search conducted for the scoping synthesis (update search on 21 January 2021).

Screening for inclusion

Proquest® Refworks was used to manage references and remove duplicates before importing to Covidence (Melbourne, Australia) to facilitate screening and initiate a second deduplication process. Titles/abstracts were reviewed, independently, by two members of the research team. Full text copies of all studies included at title/abstract screening stage were retrieved and screened independently by two members of the research team. Each record was screened and determined if it met the inclusion criteria for any of the three review sections. Conflicts were resolved by discussion or by input from a third reviewer.

Inclusion criteria

Distinct inclusion criteria were adopted for each review section. However, some features were common to all sections and are therefore presented here to avoid duplication. To be included in any review, at least one TA in the investigation was required to include an exercise component. In addition, we required studies to report sufficient information regarding the exercise intervention to enable appropriate identification of the exercise class (resistance, flexibility, proprioception, plyometric or vibration) and the exercise dose. In clinical settings it has been recommended that exercise dose is determined by duration, frequency and intensity.[84] To be included in the review we required studies to provide sufficient information to describe at least two of the three parameters describing exercise dose. Where sufficient information was not presented in the main text of a study, a search was made of the publisher's website to check for supplementary files that may include relevant information. To reflect the broad range of exercise therapies used in the management of tendinopathy, we included exercise therapies delivered in a range of settings (e.g. primary care, secondary care, community, people's homes) and delivered by a range of health or exercise professionals (e.g. physiotherapists, strength and conditioning coaches, personal trainers) or support workers. We also included both supervised and unsupervised exercise therapies.

Inclusion based on tendinopathy location differed across the review sections. However, for all sections we accepted trial authors' diagnoses where a clearly verifiable group of clinical features is reported including: pathognomonic location of pain; a symptom-altering response to applied load and/or stretch, with there being a specific test for most tendinopathies; strategies to rule out differential diagnoses; ultrasound or magnetic resonance imaging confirmation of structural change. We included studies with mixed groups where there was clear reporting of the tendinopathic group, or those participants comprised >90% of the investigated cohort.

We only included data from RCTs or quasi-experimental trials. In addition, studies were required to meet the overall context of the reviews which included primary care, secondary care or community locations in any developed nation (defined as the top 62 countries in the HDI).[54] Given the modelling focus of the efficacy reviews and the aims of quantitatively synthesising data across many sources, only those studies that included data that could be incorporated into meta-analyses were included. As for the scoping review, bespoke data-extraction forms were created for each of the three reviews (*Supplementary Materials 3–5*).

Inclusion results

The search strategy identified a total of 9246 potential studies, with 4635 remaining following removal of duplicates. After title and abstract screening 4210 studies were removed, leaving 425 studies obtained for full text screening. Of these studies, a further 221 were excluded (NIHR129388 *Supplementary Material 6*) leaving a total of 204 studies that were included throughout the different parts of the efficacy review (see *Figure 7*). The reasons for exclusion on full text screening included: insufficient information regarding exercise therapy: 116, wrong study design, 35; wrong HDI rank, 22; duplicates, 17; wrong concept, 14; wrong outcomes, 13; wrong population, 2; and not tendinopathy specific, 2 (see *Figure 7*).

Data extraction

Data were extracted independently by eight members of the review team (PS/KC/LA/RM/LG/EP/JS/AP) into pre-piloted excel sheets. Separate extraction sheets were developed for the three different review sections (*Supplementary Materials 4–6*). Each entry was then double-checked by a different member of the review team. Where pre-post intervention data were not presented in text but in figures, data were extracted using digitisation software (PlotDigitizer Version 2.6.8).

Risk of bias

We used Cochrane's Risk of Bias tool[85] and six outcome domains: (1) selection bias (random sequence generation and allocation concealment); (2) performance bias (blinding of participants); (3) detection bias (blinding of outcome assessors); (4) attrition bias (incomplete outcome data); (5) reporting bias (selective reporting); and (6) other bias, to assess risk of bias for RCTs and domains 2 to 6 for non-randomised trials. Risk of bias was recorded for each outcome and time point within each study. When obtaining a summary risk of bias for each domain within a study, the mode category across all outcomes and timepoints was selected. The Cochrane's Risk of Bias tool[85] was selected as a recent review of popular risk of bias tools in tendinopathy management highlighted none was superior[86] and Cochrane's Risk

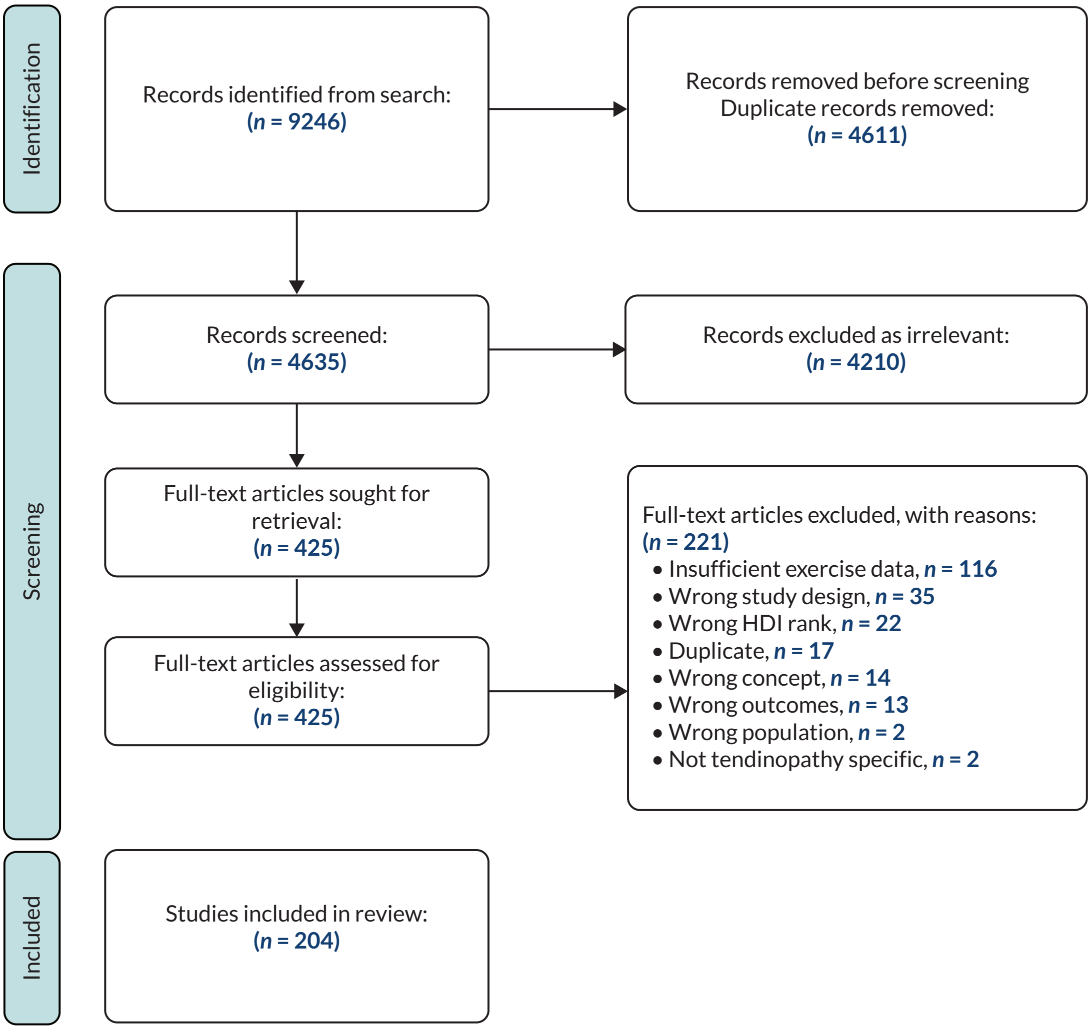

FIGURE 7 PRISMA chart describing study selection for overall efficacy review.
From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. https://doi.org/10.1136/bmj.n71.

of Bias tool[85] could be semi-automated with RobotReviewer,[87] a machine-learning system software. RobotReviewer was used to make initial assessments on selection bias and performance bias domains, with manual validation made on the relevant free texts extracted to support the final selection of low, high or unclear risk of bias. This semi-automated process was more efficient and pragmatic given the large number of included studies and provided an additional element of consistency in the review process.

Confidence in cumulative evidence

The strength of evidence was assessed using the Grading of Recommendations Assessment Development and Evaluation (GRADE) guidelines[88,89] and transparent reporting recommended in a recent review of how to improve reporting of evidence in tendinopathy management.[90] Assessments were made at the outcome level, with strength of evidence assessed according to overall risk of bias, inconsistency, imprecision, indirectness and small-study effects (e.g. publication bias and other biases associated with small number of studies). Overall risk of bias was identified by the mode rating across all outcome data included in the analysis, with a ranking of high, low or unclear risk of bias. Inconsistency was assessed based on meta-analysis results and comparison of central and variance parameter estimates. Imprecision was judged based on the number of data points available (number of studies, TAs and outcome measures) and width of credible intervals (CrIs) for central estimates. Based on inclusion criteria that were developed from the scoping review and stakeholder workshops it was determined that indirectness for all outcomes would be identified as low risk. Small-study effects were assessed using visual inspection of the distribution of effect sizes and their sampling variance. Overall strength of evidence was categorised as high/moderate/low/very low. Assessments began with a categorisation of high strength of evidence and were downgraded one level for each of the domains that were not judged low risk. Potential upgrading factors included the presence of large effects or evidence of dose-response.[88,89]

Data synthesis overview

Distinct data synthesis approaches were adopted across the three review sections. Full details of each analysis approach are presented in the review-specific sections; however, the following provides brief overviews.

Efficacy review section 1

Data synthesis approaches for efficacy review 1 were separated into three parts (A, B, C) based primarily on the distinct analysis approaches and the research questions targeted. The primary aim of efficacy review 1A was to quantify effect size distributions describing change in continuous outcomes measured at baseline and at subsequent time points. Therefore, a data synthesis approach was adopted to describe the overall effect size distributions, estimating threshold values that could be used to describe 'small', 'medium' and 'large' effect thresholds. This approach enabled a more detailed exploration of the efficacy of exercise therapies, quantifying the distribution of improvements that should be expected. These distributions were then compared across different tendinopathy locations and outcome domains to assess if these factors acted as modifiers and to address objective 4 of the project (Does type/location of tendinopathy or other specific covariates affect which are the most effective exercise therapies?). Similarly, the effect of intervention and participant characteristics on expected effect sizes was also investigated by quantifying the extent to which exercise supervision and symptom duration of patients influenced effect sizes. In addition to continuous outcome measures, a smaller number of binary and ordinal level data were collected post-intervention quantifying, in the main, patient satisfaction, perceived change and number of adverse events. Data were synthesised for these outcomes in efficacy review 1B estimating the central tendency expressed primarily as proportions (e.g. mean proportion satisfied or experiencing an adverse event, or mean satisfaction of perceived change expressed a proportion of maximum). Finally, based on the results of the scoping review and workshops conducted with clinicians and exercise professionals, it was evident that most exercise therapies comprised resistance exercise and that this exercise mode was the most amenable to quantification of exercise dose and therefore exploration of dose–response relationships. Therefore, efficacy review 1C comprised meta-analyses and meta-regressions performed on intervention data obtained from treatments where resistance exercise was identified as the dominant class. Meta-regressions explored relationships between dosing variables (e.g. frequency, intensity and volume) and mean effect sizes.

Efficacy review section 2

The data synthesis approach in efficacy review 1 enabled a large amount of exercise data to be modelled and the distributions of effect sizes from exercise therapies to be quantified and potential moderators explored. However, effect sizes are likely to be influenced by a range of factors, for many of which appropriate data are not available to control for statistically. Therefore, the purpose of the analysis approach in efficacy review 2 was to calculate and synthesise pairwise effect sizes quantifying comparative efficacy of two or more exercise therapies on the same population. Similar to the analyses of review section 1, investigations were restricted to exercise-only therapies, with the addition of other treatments such as electro-therapy or injection excluded. Comparisons were made on the therapy class (e.g. resistance, flexibility, proprioception) and treatments (e.g. resistance: eccentric-only, isometric; flexibility: static, dynamic; proprioception: movement pattern retraining and sense of joint position and force). Analyses quantifying comparative efficacy were conducted first by fitting direct pair-wise effect sizes between different class and treatment levels, then by network meta-analyses (NMAs) enabling direct and indirect effect sizes to be combined.

Efficacy review section 3

The purpose of the analysis approach in the efficacy review 3 was to calculate and synthesise pairwise effect sizes to investigate comparative efficacy of exercise therapies, non-exercise therapies, and the combination of exercise and non-exercise therapies on the same populations. Similar approaches to efficacy review 2 were included, with both direct pair-wise comparisons and NMAs used to synthesis results and identify a treatment hierarchy.

Efficacy review 1

The purpose of efficacy review 1 was to quantify the efficacy of exercise-only therapies across a range of outcome domains and tendinopathy locations. The potential for efficacy to be influenced by a range of factors including exercise and patient characteristics was also explored. The review was split into three parts to account for the wide range of outcomes and data types collected across the evidence base. Parts A and B focussed on the core health-related outcome domains,[51] including those typically measured by continuous measures (pain, function, PFC, disability, QoL, participation) and those typically measured by binary or ordinal measures (patient rating and adverse events), respectively. Part C of the review focussed on investigating the dose–response of therapies where resistance exercise was the dominant exercise class.

Review-specific methods

The following sections describe the specific inclusion criteria, data extraction and statistical analyses employed across the three parts of efficacy review 1. The inclusion criteria were influenced by the project aims, the results of our initial scoping review mapping the exercise and tendinopathy literature as well as stakeholder workshops.

Participants

This meta-analysis included people of any age or gender with a diagnosis of any tendinopathy for part B, and a diagnosis of RCRSP, lateral elbow, patellar, Achilles or gluteal tendinopathy for parts A and C. Any severity or duration of tendinopathy was included.

Intervention

The intervention being assessed is exercise therapy. Based on the scoping review and stakeholder workshops, it was decided that components of exercise therapies could be categorised into five different classes: (1) resistance; (2) plyometric; (3) vibration; (4) flexibility and (5) proprioception. Definitions for each exercise class are presented in *Appendix 4* (see *Tables 34* and *35*). For efficacy review 1 parts A and B, exercise interventions comprising any of the five therapy classes were included. For part C, only exercise interventions where resistance exercise was classified as the dominant class were included. Interventions combining exercise with other therapies (e.g. laser, shockwave, MT or injection) were not included in any of the review parts.

Comparator

No head-to-head comparators were included, and all effect sizes were derived from the data obtained from exercise-only interventions.

Outcomes

Based on the results of our initial scoping review and subsequent stakeholder workshops, in parts A and C we included outcomes that quantified six domains: disability, pain (either on loading, over a specified time, or without further specification), PFC, function, quality of life (QoL) and ROM (for RCRSP only). For part B, we included outcomes that quantified adverse events, participation, patient satisfaction and perception of change. Definitions of each domain and example tools are presented in *Appendix 4* (see *Table 36*).

Statistical analysis overview

All meta-analyses conducted in this report were generated under a Bayesian framework. This approach was selected over a traditional frequentist approach as the former provides a more flexible modelling approach and enables meta-analysis results to be interpreted intuitively through reporting of subjective probabilities[91] focussing on strength and direction of evidence, rather than over-reliance on dichotomous interpretations of results (e.g. with null hypothesis significance testing). In general, weakly informative default priors were used for model parameters. However, where model constraints or sufficient external information existed, informative priors were used to generate more accurate estimates. Inferences from all analyses were performed on posterior samples generated using the Hamiltonian Markov Chain Monte Carlo method. Interpretations were based on the median value ($SMD_{pre0.5}$: 0.5-quantile) and CrIs with 95% widths set for intercept parameters and 75% widths set for variance parameters. Where meta-regressions were conducted, interpretations were also based on probabilities calculated from the posterior sample and quantifying the chance that the pooled mean effect size of one level of the covariate was greater than another. Meta-analyses were conducted using the R wrapper package brms interfaced with Stan to perform sampling.[91,92] Convergence of parameter estimates was obtained for all models with Gelman-Rubin R-hat values below 1.1.[93]

Statistical analysis efficacy review 1A

To synthesise effects across different measurement outcomes within each domain, standardised mean difference (SMD_{pre}) effect sizes were calculated by dividing the relevant mean difference by the pre-intervention standard deviation and including a small sample bias correction.[94] Where required, SMD_{pre} values were reflected by multiplying by −1 to ensure that positive values represented an improved clinical effect. Where outcomes were assessed at multiple time-points following baseline measurement, all possible SMD_{pre} values were calculated and included in the meta-analysis models. Where means and standard deviations were not presented but included combinations of the median, range or interquartile range, the values were estimated by the calculations presented by Wan *et al*. (2014)[95] Where sufficient information was not available to estimate standard deviations (e.g. based on confidence intervals), these were imputed through simple linear regression of the log-transformed standard deviations and means obtained from all other studies.[96] Separate regressions were performed for pre- and post-intervention data.

All meta-analyses were conducted using a nested four-level mixed-effects meta-analytic model.[97] The series of nestings included the individual study (level 4), the outcome (level 3), the measurement occasion (level 2) and the sampling variance (level 1). The sampling variance of SMD_{pre} values was calculated using standard distributional assumptions. However, these values require an estimate of the pre-post correlation, which is rarely reported in studies. To account for uncertainty in the sampling variance, values within the model were allowed to vary and were estimated by including an informative Gaussian prior approximating correlation values centred on 0.7 and ranging from 0.5 to 0.9. To quantify small, medium and large threshold values, parameters from the respective model were used to generate posterior predictions and the 0.25-, 0.5- and 0.75-quantiles calculated, respectively. It was determined a priori to assess the influence of tendinopathy type, outcome domain, assessment duration, training status (performance, sporting and other) and supervised versus non-supervised exercise on effect size and threshold values. This was achieved by subset analysis for training method and outcome type, and meta-regressions for assessment duration, training status and supervision. Meta-regressions were presented by selecting one level of the factor as a reference to make comparisons with the median and 95% CrI given ($\beta_{Reference:Comparison}$ = Median [95% CrI: lower bound to upper bound], such that $\beta >$ 0 indicates an increased effect of the comparison relative to the reference). The initial meta-analysis model combining the entire data set was fitted with a normal distribution, a skew normal distribution and a *t*-distribution. No substantive improvements in model fit were obtained with the skew normal or *t*-distributions based on the Watanabe–Akaike information criterion. Consequently, a normal distribution was used throughout all analyses. Due to the large number of outcomes and the potential for outliers to influence estimates,[98] outlier SMD_{pre} values were identified by adjusting the distribution by a Tukey *g*-and *h*- distribution and obtaining the 0.0035- and 0.9965-quantiles, with values beyond these points removed prior to further analysis.[99]

Statistical analysis efficacy review 1B

A series of meta-analyses were conducted to synthesise results from reporting of adverse events, participation, patient satisfaction and patient rating (perception of condition and recovery) following exercise therapy for the management of tendinopathy. Adverse events and patient satisfaction measures comprised binary post-intervention data such that the proportion of adverse events or patients stating satisfaction with the exercise therapy was calculated from each study. The logit transformation was used on proportional data and sampling variances calculated using standard distributional assumptions.[100] Continuity correction factors were applied for proportions equal to 0 or 1. After pooling data and obtaining uncertainty estimates, values were back-transformed and expressed as proportions.[100] Where large numbers of proportions were equal to 0 or 1, exact binomial meta-analysis models were conducted.[101]

Post-intervention data quantifying patient ratings of condition and recovery were standardised by scaling group means relative to their maximum values. For outcomes restricted to positive values, items were shifted to have zero as the lowest value and the group mean was divided by the shifted maximum such that effect sizes ranged from 0 to 1. That is, if the item was scored on a 2 to 10 scale, 2 was subtracted from the group mean and this shifted value divided by 8. In contrast, for outcomes already centred on zero between two symmetric positive and negative maximum values, the group mean was divided by the positive maximum such that effect sizes ranged from −1 to 1. Sampling variances for both sets of outcomes were calculated using group standard deviations and the number of patients in each group.

All meta-analyses were conducted within a Bayesian framework employing three-level hierarchical models to enable inclusion of multiple data points from the same study where available. In general, weakly informative Student-*t* prior and half-*t* priors with 3 degrees of freedom and scale parameter equal to 2.5 were used for intercept and variance parameters.[102] However, informative flat priors were used for the intercept parameter of outcomes that were scaled relative to their maximum value (e.g. uniform 0 to 1, or uniform −1 to 1). It was identified a priori that moderator analyses investigating the effects of assessment duration (length of time from baseline to follow-up measurement) and tendinopathy type on outcome variables would be included. Assessment duration was categorised as short (≤12 weeks), medium (13–52 weeks) and long (>52 weeks). Moderator analyses were only performed where at least 10 data points were available for each category, and where required tendinopathy types were grouped into upper- and lower-body tendinopathies.

Statistical analysis efficacy review 1C

The purpose of the meta-analyses conducted in part of the review was to explore which exercise-related factors of the therapy influenced efficacy. Based on results from the scoping review and discussions with stakeholders, analyses were limited to resistance exercise. This decision was made due to resistance exercise being shown to be the most popular exercise modality in the management of tendinopathy, and it was identified that resistance exercise provided the best opportunity to appropriately characterise and quantify exercise dose. For each study and outcome extracted, attempts were made to quantify exercise intensity, volume and frequency. For exercise intensity it was identified whether the study prescribed loads based on absolute loading criteria (e.g. newtons when using elastic resistance and kilograms when using isoinertial loads) or relative criteria (e.g. percentage of the maximum load that could be lifted). The actual loads prescribed were also recorded where available. Exercise intensity was also categorised using a binary structure comprising body mass only (entire body mass or mass of a limb) or addition of external resistance (e.g. in the form of a loaded backpack, dumbbell or elastic resistance). Exercise volume was calculated by recoding the number of sets and repetitions, and the number of resistance exercises prescribed. Exercise frequency was calculated by recording the number of sessions prescribed per week.

Where multiple resistance exercises were prescribed, the exercise intensity and volume calculated by the multiplication of sets and repetitions were calculated for the primary resistance exercise only.

Due to the use of different outcome domains and different tests within the same outcome domain, pooling of data required standardisation. This was achieved using the standardised mean difference (SMD_{pre}) effect size, dividing the mean group change by the pre-intervention standard deviation. Where required, SMD_{pre} values were reflected by multiplying by −1 to ensure that positive values represented an improved clinical effect. Where multiple outcomes were reported from the same study (different outcomes and/or the same outcome at multiple time points), all possible SMD_{pre} values were calculated and included in the meta-analysis models. To account for covariances created, all meta-analyses were conducted using a nested four-level model.[97] The series of nestings included the individual study (level 4), the outcome (level 3), the measurement occasion (level 2) and the sampling variance (level 1). The relative contributions of variance sources were described by variance partition coefficients (VPCs) calculated by dividing each estimated variance level by the total sum. The meta-analysis was conducted within a Bayesian framework providing additional flexibility in the handling of within-study variances and enabled model estimates to be interpreted more intuitively through reporting of subjective probabilities.[91]

To assess the effects of dose variables, meta-regressions were performed with intensity (limb/bodyweight versus additional external) and volume (lower volume: less than 45 repetitions versus 45 or more repetition) comprising a binary categorisation, and frequency (less than once a day versus once per day and more than once per day) comprising a trinary categorisation. Meta-regressions were presented by selecting one level of the factor as a reference to make comparisons ($\beta_{Reference:Comparison}$ = Median [95% CrI: LB to UB], such that $\beta > 0$ indicates an increased effect of the comparison relative to the reference). Meta-regressions were only performed in cases where at least 10 outcomes from two or more TAs were available for each level of the potential moderator.

Efficacy review 1 overall results

Study selection

Of the 204 studies identified for the overall review, a total of 125 studies were included across the three parts of efficacy review 1 (see *Appendix 5*, *Table 37*) after 75 studies were removed for not including an exercise-only TA. The 125 studies comprised 188 TAs and a total of 4612 patients. Descriptions of the age, BMI, gender proportions, training status and symptom duration of the patients are presented in *Table 4*. Similarly, a summary of the tendinopathies, outcome domains and dominant exercise classes investigated across the 188 TAs is presented in *Table 4*.

Distribution of outcome domains and dominant exercise classes across the five most studied tendinopathies is illustrated in *Figures 8* and *9*. The distribution of outcome domains was relatively consistent across tendinopathy types, with disability and pain outcomes measured most frequently. In addition, ROM was commonly measured in studies investigating RCRSP. In contrast, clear differences were identified in the distribution of dominant therapy classes across tendinopathies. Resistance exercise featured as the dominant class in more than 90% of TAs across all tendinopathies except RCRSP, where resistance exercise comprised approximately 50% of the distribution combined with relatively equal numbers of TAs where flexibility or proprioception were the dominant exercise classes.

Risk of bias

Risks of bias expressed for each individual study included across the different parts of efficacy review 1 are presented in *Appendix 6*. A summary of the risk of bias assessment across the studies expressed in percentages is presented in *Table 5*. For RCTs risk of bias was highest for 'other bias' (48% high risk of bias), blinding (participants: 40% high risk of bias; outcome assessors: 22% high risk of bias) and incomplete outcome bias (13% high risk of bias). For quasi-experimental trials, risk of bias was also

TABLE 4 Patient characteristics, outcome domains, tendinopathy locations and dominant exercise therapy classes identified across 188 exercise-only TAs

Characteristic	Median (IQR)	Percentage unavailable
Age (mean)	47.0 (42.6–49.2)	1.6%
Age (SD)	9.0 (7.1–11.1)	17.6%
BMI (mean)	25.8 (24.7–27.9)	64.0%
BMI (SD)	4.1 (3.1–4.5)	72.8%
Percentage female	47.3 (34.5–61.4)	4.8%
Symptom duration months (mean)	14.5 (6.3–25.9)	35.2%
Symptom duration months (SD)	11.0 (4.2–27.7)	59.2%
Training status	4.8% Performance athlete 11.3% Recreational athlete 83.9% Other	0.8%
Outcome domain (*N*; % TAs)	**Tendinopathy location (*N*; % TAs)**	**Exercise therapy class (*N*; % TAs)**
Disability (470; 26.2%)	RCRSP (81; 43.1%)	Resistance (136; 72.3%)
Pain (452; 25.2%)	Achilles (47; 25.0%)	Flexibility (29; 15.4%)
PFC (354; 19.7%)	Elbow (32; 17.0%)	Proprioception (21; 11.2%)
ROM (166; 9.3%)	Patellar (20; 10.6%)	Vibration (2; 1.1%)
Patient rating (102; 5.7%)	Gluteal (4; 2.1%)	
Participation (61; 3.4%)	Hamstring (2; 1.1%)	
Function (85; 4.7%)	Biceps (1; 0.5%)	
QoL (65; 3.6%)	Tibialis posterior (1; 0.5%)	
Adverse events (39; 2.2%)		

BMI, body mass index; IQR, interquartile range; SD, standard deviation.

highest for 'other bias' (79% high risk of bias) and reporting quality was also lower, with high percentages of unclear risk of bias identified for selective reporting (86% unclear risk of bias) and blinding (participants: 38% unclear risk of bias; outcome assessors: 54% unclear high risk of bias).

Efficacy review 1A results: exercise-only continuous health-related measurements

Study characteristics, tendinopathies and outcomes

Across the 125 studies comprising at least one exercise-only TA, data from 115 studies were included in efficacy review 1A. Studies were excluded based on the wrong tendinopathy (n = 3), wrong outcome domain (n = 2), and for not including sufficient data to meet the requirements of the meta-analysis models (n = 5). In total, the 115 included studies comprised 173 TAs and 4161 participants. Descriptions of the study characteristics, tendinopathy types and outcome domains are presented in *Table 6*. Outcomes obtained from studies investigating gluteal tendons were not included in the analysis based on the number of effect sizes falling below the a priori threshold set to generate accurate estimates of the population effect size distribution. Risk of bias results for individual studies are presented in *Appendix 6*, *Table 38*.

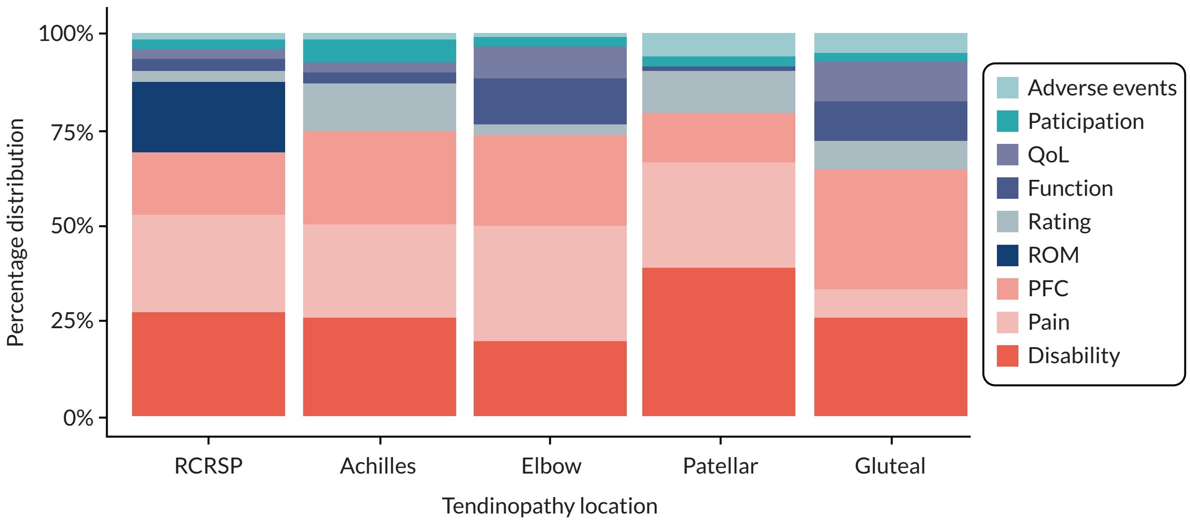

FIGURE 8 Relative distributions of outcome domains across the five most studied tendinopathy locations.

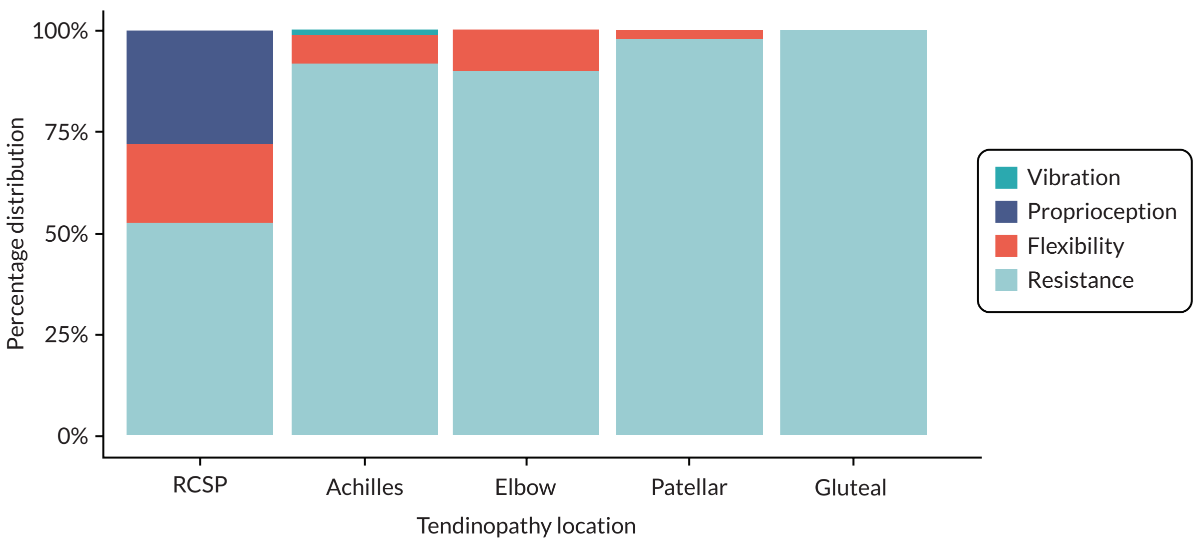

FIGURE 9 Relative distributions of dominant exercise therapy class across the five most studied tendinopathy locations.

Description of effect size distributions

From the initial 1466 outcomes extracted, a total of 44 outliers were removed from the analysis, with a lower bound threshold of −0.82 (6 effect sizes below) and an upper bound threshold of 7.0 (38 effect sizes above). Across all outcomes and tendinopathy types, direct calculation of the 0.25- (small), 0.5- (medium) and 0.75-quantiles (large) from the complete empirical data returned the following SMD_{pre} values: 0.37, 0.77 and 1.31, respectively. Application of the meta-analysis model across this complete data set with borrowing of information across studies resulted in similar but shrunken estimates (0.25-quantile$_{0.5}$ = 0.34 [95% CrI 0.31 to 0.37]; 0.5-quantile$_{0.5}$ = 0.73 [95% CrI 0.70 to 0.77]; and 0.75-quantile$_{0.5}$ = 1.22 [95% CrI 1.17 to 1.27]).

Analysis of effect size distributions across the different tendinopathy locations is illustrated in *Figure 10* with numerical values presented in *Table 7*. Analysis of the modelled small, medium and large thresholds showed considerable overlap in small and medium thresholds across all tendinopathy locations (0.25-quantile$_{0.5}$ ranged from 0.30 to 0.38; 0.5-quantile$_{0.5}$ ranged from 0.70 to 0.85). However, greater divergence was identified for large threshold estimates, with the greatest values estimated for elbow tendinopathy (0.75-quantile$_{0.5}$ ranged from 1.18 to 1.62).

TABLE 5 Efficacy review 1 risk of bias assessment for RCTs (top; *N* = 110) and non-randomised trials (bottom; *N* = 15) with percentages of low-, unclear- and high-risk evaluations expressed relative to the number of TAs (upper value) and the total number of data points (lower value)

		Random Sequence Allocation	Allocation concealment	Blinding of participants	Blinding of outcome assessors	Incomplete outcome bias	Selective reporting	Other bias
Randomised Controlled Trials	Low Risk	77% 79%	60% 61%	28% 29%	55% 60%	63% 69%	27% 32%	44% 46%
	Unclear	19% 17%	35% 35%	32% 33%	24% 19%	25% 19%	70% 63%	8% 7%
	High Risk	4% 4%	5% 4%	40% 38%	22% 21%	12% 13%	4% 4%	48% 47%
Non-Randomised Controlled Trials	Low Risk	NA	NA	46% 63%	46% 40%	79% 90%	14% 17%	7% 17%
	Unclear	NA	NA	38% 30%	54% 60%	21% 10%	86% 83%	14% 24%
	High Risk	NA	NA	15% 6%	0% 0%	0% 0%	0% 0%	79% 60%

Analysis of the effect size distributions across outcome domains is presented in *Figure 11* with numerical values presented in *Table 8*. A clear split was identified between the domains of QoL and the objective measures of PFC and ROM, versus the subjective measures of function, disability and pain. The lowest threshold values were estimated for QoL, physical functional capacity and ROM, with the small threshold for QoL estimated to be below zero (0.25-quantile$_{0.5}$ = −0.21 [95% CrI −0.33 to −0.08]). In contrast, the greatest effect sizes values were obtained for outcomes measuring disability, pain and function, with the reduced amount of data for function resulting in wider CrIs. Central estimates indicated that small threshold estimates for domains with the greatest effect sizes were situated between the medium and large threshold estimates for domains with the lowest effect sizes (see *Figure 11*).

Moderator analyses

Moderator analyses investigating potential changes in the mean effect size across all outcomes and tendinopathies are presented in *Table 9*. Composition of outcome domains and tendinopathy locations across the levels of each moderator are presented in *Appendix 6* (see *Table 39*) along with individual domains for the strength of evidence assessment (see *Appendix 6*, *Table 40*). Evidence of a moderator effect was identified for assessment duration (short: ≤12 weeks; medium: 13–52 weeks; long duration: >52 weeks), with results showing a hierarchy and greater mean estimate with increased time from baseline assessment (short duration ($\beta_{\text{Short:Medium0.5}}$ = 0.28 [95% CrI 0.23 to 0.32]; $\beta_{\text{Short:Long0.5}}$ = 0.37 [95% CrI 0.27 to 0.47]). These estimates remained consistent after meta-regressions were controlled for tendinopathy location and outcome domain ($\beta_{\text{Short:Medium0.5}}$ = 0.28 [95% CrI 0.23 to 0.32]; $\beta_{\text{Short:Long0.5}}$ = 0.38 [95% CrI 0.27 to 0.48]). Consistent evidence of a moderating effect was also obtained for supervision, with greater mean estimate for supervised exercise therapies ($\beta_{\text{Unupervised:Supervised0.5}}$ = 0.43 [95% CrI 0.09 to 0.78]), which increased in estimate after controlling for tendinopathy location and outcome domain ($\beta_{\text{Unupervised:Supervised0.5}}$ = 0.70 [95% CrI 0.39 to 1.0]). Finally, some evidence was obtained indicating a hierarchy of effects with regard to symptom duration and greater mean estimates with patients reporting shorter durations ($\beta_{\text{Medium:Short0.5}}$ = 0.47 [95% CrI −0.01 to 0.95]; $\beta_{\text{Long:Short0.5}}$ = 0.67 [95% CrI 0.19 to 1.1]). However, differences between the symptom duration levels were close to zero after

TABLE 6 Distribution (percentiles) of study characteristics, tendinopathy locations and outcome domains calculated across TAs of studies in efficacy review 1A

Study characteristic	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Participants per group	5	10	13	16	19	20	24	29	31	44	70
Mean age	22.5	28.0	39.8	42.6	44.0	46.0	47.9	48.6	49.9	51.8	62.1
Mean symptom duration (months)	0.85	4.5	6.0	7.4	11.0	17.5	19.5	23.8	28.9	36.6	98.5
Publication year	1998	2005	2007	2009	2012	2014	2015	2017	2017	2019	2020
Intervention length (weeks)	2	4	4	4	6	8	12	12	12	12	21
Measurement duration (weeks)	0.7	3	4	4	5	6	6	11	12	13	104
Tendinopathy type	**Number of TA (%)**		**Number of effects (%)**		**Outcome domain**			**Number of TA (%)**		**Number of effects (%)**	
RC	77 (44.5)		817 (55.7)		Disability			142 (82.1)		447 (30.5)	
Achilles	45 (26.0)		321 (21.9)		Pain			124 (71.7)		410 (28.0)	
Lateral elbow	31 (17.9)		239 (16.3)								
Patellar	20 (11.6)		89 (6.1)		PFC			61 (35.3)		324 (22.1)	
RC	77 (44.5)		817 (55.7)		Disability			142 (82.1)		447 (30.5)	
Achilles	45 (26.0)		321 (21.9)		Pain			124 (71.7)		410 (28.0)	
Lateral elbow	31 (17.9)		239 (16.3)								
Patellar	20 (11.6)		89 (6.1)		PFC			61 (35.3)		324 (22.1)	
Dominant exercise class	**Number of TA (%)**		**Number of effects (%)**		ROM			30 (17.3)		159 (10.8)	
Resistance	126 (72.8)		1026 (70.0)		Function			31 (17.9)		72 (4.9)	
Flexibility	25 (14.5)		215 (14.7)								
Proprioception	21 (12.1)		223 (15.2)		QoL			12 (6.9)		54 (3.7)	
Vibration	1 (0.6)		2 (0.1)								

Pain, pain without further specification; Pain loading, pain on loading; Pain time, pain over a specified time; TA, treatment arm.

controlling for tendinopathy location and outcome domain ($\beta_{Medium:Short0.5}$ = 0.02 [95% CrI −0.41 to 0.45]; $\beta_{Long:Short0.5}$ = 0.07 [95% CrI −0.35 to 0.50]). Strength of evidence was judged between low and moderate for assessment duration and supervision. Downgrading was due to imprecision from wide CrIs based on imbalances in trial numbers and consistent small-study effects highlighting a strong skew and relatively high frequency of very large positive effect sizes. Strength of evidence was consistently low for analysis of assessment duration also based on imprecision and small-study effects.

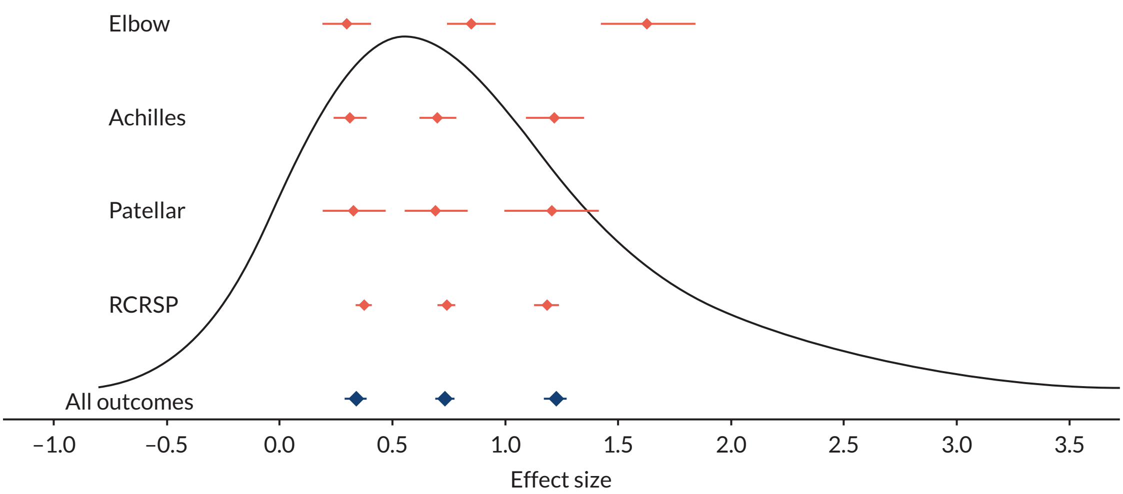

FIGURE 10 Effect size distributions across tendinopathy locations with identification of small, medium and large thresholds.
Black curve represents density plot of empirical effect size distribution. Diamonds with intervals represent small, medium and large thresholds with CrIs (black: all outcomes; red: tendinopathy specific).

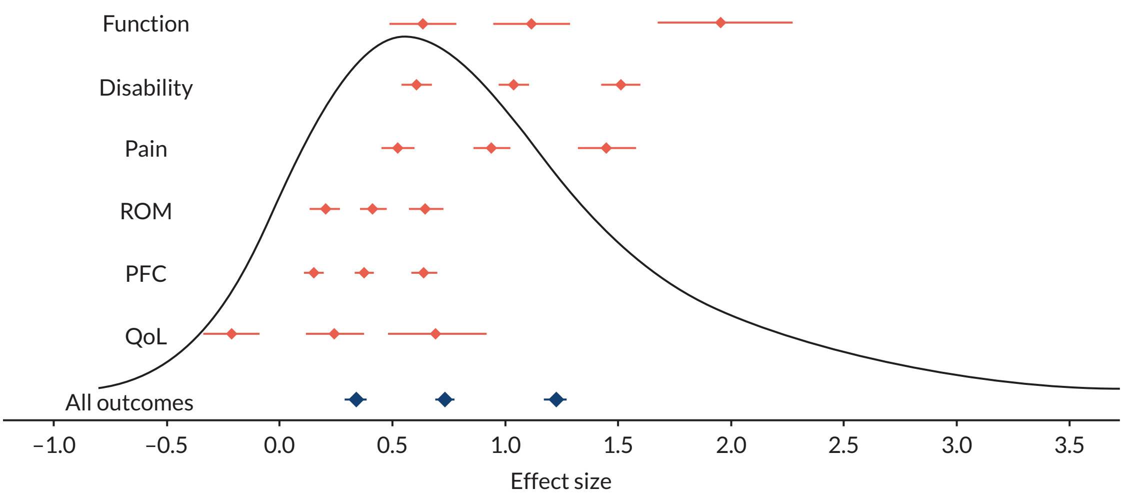

FIGURE 11 Effect size distributions across outcome domains with identification of small, medium and large thresholds.
Black curve represents density plot of empirical effect size distribution. Diamonds with intervals represent small, medium and large thresholds with CrIs (black: all outcomes; red: tendinopathy specific).

Efficacy review 1B results: exercise-only patient adverse events and patient rating outcomes

Study characteristics, tendinopathies and outcomes

Of the 125 studies including exercise-only therapies, a total of 52 studies (48 RCTs and 4 quasi-experimental trials) comprising 72 TAs and 1957 participants were identified to include adverse event or patient rating data (see *Appendix 5*, *Table 37*). A summary of the extracted data including study numbers and the specific tendinopathy locations investigated is presented in *Table 10*. Risk of bias results for individual studies are presented in *Appendix 6*, *Table 41*.

TABLE 7 Meta-analysis results for all outcomes pooled across different tendinopathy locations

Tendinopathy location	Small [95% CrI]	Medium [95% CrI]	Large [95% CrI]	Study VPC [75% CrI]	Outcome VPC [75% CrI]	Measurement VPC [75% CrI]
All	0.34 [0.31 to 0.37]	0.74 [0.71 to 0.77]	1.23 [1.18 to 1.28]	0.74 [0.69 to 0.78]	0.26 [0.22 to 0.31]	0.01 [0.00 to 0.02]
RCRSP	0.38 [0.34 to 0.41]	0.74 [0.70 to 0.78]	1.18 [1.12 to 1.24]	0.55 [0.48 to 0.62]	0.45 [0.37 to 0.52]	0.01 [0.00 to 0.02]
Achilles	0.32 [0.25 to 0.39]	0.70 [0.62 to 0.78]	1.22 [1.10 to 1.35]	0.71 [0.59 to 0.81]	0.27 [0.18 to 0.39]	0.01 [0.00 to 0.03]
Elbow	0.30 [0.20 to 0.41]	0.85 [0.75 to 0.96]	1.62 [1.43 to 1.84]	0.87 [0.81 to 0.92]	0.12 [0.07 to 0.18]	0.01 [0.00 to 0.02]
Patellar	0.33 [0.19 to 0.47]	0.69 [0.56 to 0.84]	1.21 [1.00 to 1.42]	0.57 [0.26 to 0.75]	0.41 [0.23 to 0.71]	0.01 [0.00 to 0.05]

Small, 0.25-quantile; Medium, 0.5-quantile; Large, 0.75-quantile.

TABLE 8 Meta-analysis results for all tendinopathy locations pooled across different outcome domains

Outcome domain	Small [95% CrI]	Medium [95% CrI]	Large [95% CrI]	Study VPC [75% CrI]	Outcome VPC [75% CrI]	Measurement VPC [75% CrI]
All	0.34 [0.31 to 0.37]	0.74 [0.71 to 0.77]	1.23 [1.18 to 1.28]	0.74 [0.69 to 0.78]	0.26 [0.22 to 0.31]	0.01 [0.00 to 0.02]
Function	0.65 [0.49 to 0.79]	1.11 [0.95 to 1.30]	1.95 [1.68 to 2.28]	0.51 [0.04 to 0.85]	0.47 [0.13 to 0.94]	0.01 [0.00 to 0.04]
Disability	0.61 [0.55 to 0.68]	1.04 [0.97 to 1.11]	1.51 [1.43 to 1.60]	0.78 [0.68 to 0.88]	0.15 [0.08 to 0.24]	0.05 [0.00 to 0.13]
Pain	0.53 [0.45 to 0.61]	0.94 [0.87 to 1.02]	1.45 [1.33 to 1.59]	0.26 [0.06 to 0.46]	0.71 [0.51 to 0.90]	0.02 [0.00 to 0.07]
ROM	0.21 [0.14 to 0.27]	0.42 [0.36 to 0.48]	0.65 [0.58 to 0.73]	0.88 [0.79 to 0.94]	0.10 [0.04 to 0.18]	0.01 [0.00 to 0.05]
PFC	0.16 [0.11 to 0.20]	0.38 [0.34 to 0.43]	0.64 [0.59 to 0.70]	0.73 [0.61 to 0.82]	0.27 [0.18 to 0.38]	0.01 [0.00 to 0.02]
QoL	−0.21 [−0.33 to −0.08]	0.25 [0.12 to 0.38]	0.68 [0.49 to 0.93]	0.84 [0.65 to 0.93]	0.14 [0.05 to 0.33]	0.01 [0.00 to 0.04]

Small, 0.25-quantile; Medium, 0.5-quantile; Large, 0.75-quantile.

Adverse events

Across the 39 TAs that reported the number of adverse events, 29 (74.4%) reported no adverse events, six reported adverse events between 0% and 10% of the patients, and two TAs reported relatively high percentages of adverse events of 36.4% and 64.0% (see *Figure 12*). Due to the large number of TAs reporting zero adverse events, only the exact binomial model was used to estimate the expected proportion of adverse events, which was equal to 0.002 [95% CrI 0.000 to 0.010]. The strength of evidence for the outcome was assessed as high (see *Appendix 6*, *Table 42*)

Patient satisfaction and rating

A range of measurement tools and scales were used to report the 102-patient rating outcomes across the 50 TAs. The most common outcomes reported included a binary rating of patient satisfaction (satisfied or not satisfied with treatment: 19 outcomes from 14 TAs) and the global rating of change

TABLE 9 Meta-analysis results for moderator analyses pooling all outcomes across all tendinopathies

Moderator		Estimate of mean [95% CrI]	Probabilities	Strength of evidence	Study VPC [75% CrI]	Outcome VPC [75% CrI]	Measurement VPC [75% CrI]
Assessment duration	Short (≤ 12 weeks) 931 outcomes from 147 trials	1.0 [0.87 to 1.1]	*p* (Medium > Short) > 0.999	Moderate	0.72 [0.67 to 0.76]	0.26 [0.22 to 0.31]	0.02 [0 to 0.03]
	Medium (13–52 weeks) 460 outcomes from 24 trials	1.3 [1.1 to 1.4]	*p* (Medium < Long) = 0.980	Moderate			
	Long (> 52 weeks) 51 outcomes from 2 trials	1.4 [1.2 to 1.6]	*p* (Long > Short) > 0.999	Low			
Symptom duration	One year or less 314 outcomes from 46 trials	1.5 [1.2 to 1.8]	*p* (1yr > 2yr) = 0.973	Low	0.82 [0.77 to 0.85]	0.16 [0.13 to 0.20]	0.02 [0.00 to 0.04]
	Two years or less 258 outcomes from 30 trials	1.1 [0.73 to 1.4]	*p* (2yr > +2yr) = 0.775	Low			
	Over two years 381 outcomes from 33 trials	0.89 [0.55 to 1.1]	*p* (1yr > +2yr) > 0.999	Low			
Supervision	Supervised 356 outcomes from 36 trials	1.4 [1.1 to 1.7]	*p* (Supervised > Unsupervised) = 0.994	Low	0.78 [0.74 to 0.82]	0.19 [0.16 to 0.23]	0.03 [0.00 to 0.05]
	Unsupervised 918 outcomes from 113 trials	1.0 [0.84 to 1.2]		Moderate			

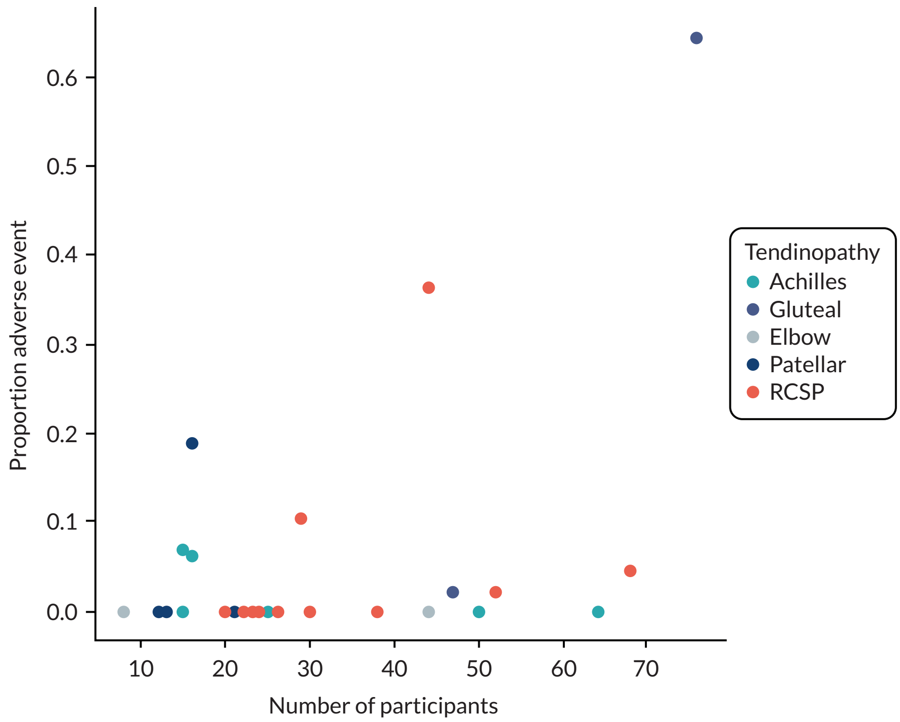

FIGURE 12 Proportion of adverse events reported across included studies.

TABLE 10 Summary of patient rating and adverse event data extracted

	Patient rating	Adverse events
Number of studies	35	30
Number of TAs	50	39
Number of participants	1265	1173
Total number of outcomes	102	39
Total Achilles outcomes	51 (50.0%)	8 (20.5%)
Total RCRSP outcomes	28 (27.5%)	17 (43.6%)
Total patellar outcomes	13 (12.7%)	7 (17.9%)
Total elbow outcomes	7 (6.9%)	5 (12.8%)
Total gluteal outcomes	3 (2.9%)	2 (5.1%)

(GROC) scales (17 outcomes from 7 TAs). The GROC scales used zero as a neutral point with values below and above this point representing negative and positive ratings of change, respectively. To enable appropriate synthesis, meta-analyses were restricted to these outcomes only. For the binary satisfaction data, the breakdown of the tendinopathy locations included seven outcomes for the Achilles, six outcomes for the patellar, four outcomes for the elbow and two outcomes for RCRSP. The pooled estimate of the proportion of patients reporting satisfaction was $ES_{0.5}$ = 0.72 [95% CrI 0.55 to 0.88]. For the GROC scales, the breakdown of the tendinopathy locations included 12 outcomes for RCRSP and 5 outcomes for the patellar. The pooled estimated of patients' perception of change was $ES_{0.5}$ = 0.52 [95% CrI 0.39 to 0.65], indicating that patients tended to rate their change approximately half-way up the positive scale. The strength of evidence assessment for both patient satisfaction (see *Appendix 6*, *Table 43*) and GROC outcomes were high (see *Appendix 6*, *Table 44*).

TABLE 11 Distribution of tendinopathy locations, outcome domains and dominant exercise classes of included studies

Tendinopathy type	Number of TA (%)	Number of effects (%)	Outcome domain	Number of TA (%)	Number of effects (%)
RCRSP	39 (30.0)	430 (40.6)	Disability	99 (76.2)	308 (29.1)
Achilles	41 (31.5)	292 (27.6)	Pain	91 (70.0)	299 (28.2)
Lateral elbow	27 (20.8)	217 (20.5)			
Patellar	19 (14.6)	87 (8.2)	PFC	47 (36.2)	262 (24.7)
Gluteal	4 (3.1)	33 (3.1%)			
Dominant exercise	**Number of TA (%)**	**Number of effects (%)**	ROM	14 (10.8)	78 (7.4)
Eccentric-only	62 (47.7)	467 (44.1)	Function	27 (20.8)	65 (6.1)
Concentric and eccentric	43 (33.1)	408 (38.5)			
Isometric	16 (12.3)	82 (7.7)	QoL	10 (7.7)	47 (4.4)
Concentric-only	7 (5.4)	58 (5.5)			
Isokinetic	2 (1.5)	44 (4.2)			

TA, treatment arms.

TABLE 12 Distribution (percentiles) of training frequency, number of exercises and number of repetitions performed for primary exercises

Study characteristic	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Training frequency	2	3	4	5	7	7	7	14	14	14	21
Number of exercises	1	1	1	2	2	2	3	5	5	6	10
Number of repetitions	3	12.5	27.8	30	32.5	45	45	45	45	45	200

Efficacy review 1C results: resistance exercise moderation

Study characteristics, tendinopathies and outcomes

Of the 125 studies including exercise-only therapies, sufficient information was obtained from 93 studies including resistance exercise as the dominant therapy class to be included in efficacy review 1C meta-analyses (see *Appendix 5*, *Table 37*). The studies comprised 130 TAs and 3040 participants. Risk of bias results for individual studies are presented in *Appendix 6*, *Table 45*. Descriptions of the tendinopathy locations, outcome domains and exercise therapies are presented in *Table 11*. Seventy-one of the TAs comprised resistance exercise only, with most multi-exercise therapies comprising resistance and flexibility classes (45 TAs). The most common dominant treatment was eccentric-only (62 TAs), followed by concentric and eccentric (43 TAs) then isometric (16 TAs). Resistance was frequently prescribed using the mass of the limbs or whole-body (40 TAs) and was infrequently prescribed based on a percentage of the maximum (11 TAs) resistance that could be overcome. The distribution of training frequency, number of exercised performed and number of repetitions performed are presented in *Table 12*. The results showed that the most common training frequency was twice per day, and that most TAs performed one to two exercises each with approximately 45 repetitions (most frequently 3 sets of 15 repetitions).

Analysis of exercise dose parameters

Based on the results of efficacy review 1A and the substantive difference in effect size distributions with a clear split between two sets of outcome domains, analyses were split into two categories described as small effects (QoL, physical functional capacity and ROM) and large effects (function, disability and pain). In addition, tendinopathy locations were categorised as upper-body (RCRSP and elbow) or lower-body (Achilles, patellar and gluteal) to increase the amount of data available for sub-analyses. Overviews of the tendinopathy locations and outcome domains included in each moderator analysis are presented in *Appendix 6*, *Tables 46*, *48*, *50* and *52*.

Exercise intensity

An analysis of exercise intensity was conducted comparing pooled mean effect sizes from a binary classification of TAs comprising body mass only resistance, or additional external resistance using, for example, TheraBands or isoinertial loads. A total of 119 TAs provided sufficient information for intensity to be coded, with 84 prescribing additional external resistance and 35 restricted to the mass of a limb or the whole body. In general, evidence was obtained for greater pooled mean values with resistance training prescribing additional external resistance (see *Table 13*), with point estimates indicating an increase of 0.2 to 0.5 for large effects. However, for analyses of small effects, values were closer and point estimates indicated increased mean values for body mass only resistance for the upper body and addition of external resistance for the lower body (see *Table 13*). Strength of evidence was generally low to moderate, with consistent evidence of small-study effects and frequent occurrences of imprecision (see *Appendix 6*, *Table 47*).

Exercise volume

Exercise volume was quantified based on the total number of resistance exercises prescribed each session, and the total repetitions prescribed (e.g. sets × repetitions) for the primary resistance exercise. Based on the distributions obtained (see *Table 12*) both variables were discretised into binary classifications characterising lower volume (<45 repetitions; two or fewer resistance exercises) and higher volume (≥45 repetitions; more than two resistance exercises).

Results were generally inconsistent for both volume variables, with no clear patterns identified across the different outcome domain and tendinopathy location groupings (see *Tables 14* and *15*). Similar point estimates were obtained for analyses conducted across the large effect outcome domains. For the small effect outcome domains some evidence was identified indicating greater effects for lower volume resistance exercise in the lower body and higher volume resistance exercise in the upper body (see *Tables 14* and *15*). However, strength of evidence assessment was frequently low due to consistent small-study effects, imprecision and some occurrences of indirectness (see *Appendix 6*, *Tables 49* and *51*).

Exercise frequency

Exercise frequency was quantified based on the number of resistance exercise sessions prescribed per week and, based on the distribution obtained (see *Table 12*), frequency was discretised into a trinary classification (less than daily, once per day or more than once per day). Meta-regressions performed comparing mean effect sizes across these categorisations are presented in *Table 16*. A consistent pattern was obtained, with the greatest pooled means generally obtained for the lowest frequency, and central estimates up to 1.1 greater for large effect outcomes and 0.59 greater for small effect outcome domains. Strength of evidence was frequently assessed as low to moderate based on consistent small-study effects and imprecision (see *Appendix 6*, *Table 53*).

Efficacy review 1 discussion

The purpose of efficacy review 1 was to quantify the efficacy of exercise-only therapies across a range of outcome domains and tendinopathy locations, and explore the extent to which efficacy was influenced by exercise and patient characteristics. In contrast to many previous systematic reviews and

TABLE 13 Moderator analyses investigating resistance exercise intensity. Pooled mean values were compared for body mass only interventions (low intensity) and addition of external resistance (high intensity). Results presented across tendinopathies (all/upper body/lower body) and outcome domains (large effect/small effect)

Moderator		Estimate of mean [95% CrI]	Probability	Strength of evidence
Large effects (all tendinopathies)	Body mass 35 TAs 193 outcomes	1.0 [0.65 to 1.4]	*p* (Additional > Body mass) = 0.989	Low
	Additional external 80 TAs 432 outcomes	1.5 [1.2 to 1.7]		Moderate
Large effects (lower body)	Body mass 24 TAs 125 outcomes	0.83 [0.54 to 1.1]	*p* (Additional > Body mass) = 0.988	High
	Additional external 34 TAs 133 outcomes	1.3 [1.0 to 1.6]		Moderate
Large effects (upper body)	Body mass 11 TAs 68 outcomes	1.4 [0.67 to 2.2]	*p* (Additional > Body mass) = 0.659	Low
	Additional external 46 TAs 299 outcomes	1.6 [1.2 to 2.0]		Low
Small effects (all tendinopathies)	Body mass 13 TAs 98 outcomes	0.53 [0.29 to 0.76]	*p* (Body mass > Additional) = 0.723	Moderate
	Additional external 36 TAs 266 outcomes	0.44 [0.30 to 0.58]		High
Small effects (lower body)	Body mass 8 TAs 83 outcomes	0.51 [0.04 to 0.92]	*p* (Additional > Body mass) = 0.851	Moderate
	Additional external 9 TAs 61 outcomes	0.73 [0.30 to 1.1]		Low
Small effects (upper body)	Body mass 5 TAs 15 outcomes	0.56 [0.20 to 0.95]	*p* (Body mass > Additional) = 0.803	Moderate
	Additional external 27 TAs 205 outcomes	0.38 [0.23 to 0.53]		Low

Large effects, effect sizes obtained from outcome domains measuring: disability, pain or function; Small effects, effect sizes obtained from outcome domains measuring: QoL, ROM or physical functional capacity.

meta-analyses that have investigated effectiveness or efficacy of exercise therapies for the management of tendinopathies,[103] a more broad and large-scale modelling approach was adopted, combining large numbers of heterogeneous studies with regard to the exercise content, populations investigated and the tendinopathy locations and outcome domains measured. The review was split into three parts to account for the wide range of outcomes and data types collected. Parts 1 and 2 focussed on the core health-related outcome domains,[56] including those typically measured by continuous measures (pain, function, PFC, disability, QoL) and those typically measured by binary or ordinal measures (patient rating and adverse events). Part 3 of the review focussed on investigating the dose–response of

TABLE 14 Moderator analyses investigating resistance exercise volume. Pooled mean values were compared for lower (<45 repetitions) and higher (≥45 repetitions) volume therapies. Analyses are presented across tendinopathies (all/upper body/lower body) and outcome domains (large effect/small effect)

Moderator		Estimate of mean [95% CrI]	Probability	Strength of evidence
Large effects (all tendinopathies)	Lower volume 51 TAs 271 outcomes	1.5 [1.2 to 1.8]	*p* (Lower volume > Higher volume) = 0.736	Moderate
	Higher volume 59 TAs 322 outcomes	1.4 [1.1 to 1.7]		Moderate
Large effects (lower body)	Lower volume 11 TAs 54 outcomes	1.0 [0.49 to 1.4]	*p* (Higher volume > Lower volume) = 0.758	Low
	Higher volume 43 TAs 176 outcomes	1.2 [0.92 to 1.4]		High
Large effects (upper body)	Lower volume 40 TAs 217 outcomes	1.6 [1.2 to 2.0]	*p* (Higher volume > Lower volume) = 0.518	Low
	Higher volume 16 TAs 146 outcomes	1.7 [1.0 to 2.3]		Low
Small effects (all tendinopathies)	Lower volume 24 TAs 169 outcomes	0.56 [0.36 to 0.75]	*p* (Lower volume > Higher volume) = 0.885	High
	Higher Volume 21 TAs 173 outcomes	0.38 [0.18 to 0.59]		Low
Small effects (lower body)	Lower volume 3 TAs 21 outcomes	1.1 [0.38 to 1.9]	*p* (Lower volume > Higher volume) = 0.938	Low
	Higher volume 13 TAs 114 outcomes	0.53 [0.17 to 0.91]		Low
Small effects (upper body)	Lower volume 21 TAs 148 outcomes	0.47 [0.31 to 0.66]	*p* (Lower volume > Higher volume) = 0.921	High
	Higher volume 8 TAs 59 outcomes	0.23 [−0.04 to 0.51]		Low

Large effects, effect sizes obtained from outcome domains measuring: disability, pain or function; Small effects, effect sizes obtained from outcome domains measuring: QoL, ROM or physical functional capacity.

therapies where resistance exercise was the dominant exercise class, which comprised most therapies. Collectively, the mixture of meta-analysis models and approaches explored the heterogeneity in the studies, generating several key and novel findings.

Efficacy review 1A main findings

It was shown that exercise therapies create a response distribution that is relatively diffuse, reflecting the large number of potential factors that are likely to exert systematic effects. The bulk of the distributions, however, identify that, in general, individuals should expect to experience substantive

TABLE 15 Moderator analyses investigating resistance exercise volume. Pooled mean values were compared for lower (≤2 exercises) and higher (>2 exercises) volume therapies. Analyses are presented across tendinopathies (all/upper body/lower body) and outcome domains (large effect/small effect)

Moderator		Estimate of mean [95% CrI]	Probability	Strength of evidence
Large effects (all tendinopathies)	Two or fewer 73 TAs 332 outcomes	1.5 [1.2 to 1.7]	*p* (Lower volume > Higher volume) = 0.797	Moderate
	More than two 43 TAs 293 outcomes	1.3 [0.95 to 1.6]		Moderate
Large effects (lower body)	Two or fewer 50 TAs 206 outcomes	1.1 [0.86 to 1.3]	*p* (Higher volume > Lower volume) = 0.670	Moderate
	More than two 8 TAs 50 outcomes	1.2 [0.68 to 1.7]		Moderate
Large effects (upper body)	Two or fewer 23 TAs 126 outcomes	2.2 [1.7 to 2.7]	*p* (Lower volume > Higher volume) = 0.997	Low
	More than two 35 TAs 243 outcomes	1.3 [0.87 to 1.7]		Low
Small effects (all tendinopathies)	Two or fewer 25 TAs 160 outcomes	0.44 [0.26 to 0.62]	*p* (Higher volume > Lower volume) = 0.604	Low
	More than two 23 TAs 197 outcomes	0.48 [0.29 to 0.66]		High
Small effects (lower body)	Two or fewer 12 TAs 72 outcomes	0.65 [0.27 to 1.0]	*p* (Lower volume > Higher volume) = 0.614	Low
	More than two 6 TAs 73 outcomes	0.57 [0.05 to 1.1]		Low
Small effects (upper body)	Two or fewer 13 TAs 88 outcomes	0.29 [0.08 to 0.52]	*p* (Higher volume > Lower volume) = 0.876	Low
	More than two 17 TAs 124 outcomes	0.46 [0.27 to 0.65]		High

Large effects, effect sizes obtained from outcome domains measuring: disability, pain or function; Small effects, effect sizes obtained from outcome domains measuring: QoL, ROM or physical functional capacity.

improvements as quantified by standardised change scores from baseline in key outcome domains including function, disability, pain, ROM, PFC, QoL, patient satisfaction and patient rating. It was also shown that the distributions of responses are likely to be similar among the most common tendinopathies, including RCRSP, Achilles, patellar and lateral elbow tendinopathies. In contrast, another key and novel finding of this review is the substantive difference in effect size distributions across commonly measured outcome domains. It was identified that lower responses should be expected in QoL and objective measurement tools commonly used to quantify physical functional capacity and ROM. Indeed, the results of the analyses demonstrated that quality-of-life assessments may decrease

TABLE 16 Moderator analyses investigating resistance exercise frequency. Pooled mean values were compared for low frequency (less than daily), moderate frequency (daily) and high frequency (more than daily). Analyses are presented across tendinopathies (all/upper body/lower body) and outcome domains (large effect/small effect)

Moderator		Estimate of mean [95% CrI]	Probability	Strength of evidence
Large effects (all tendinopathies)	Less than daily 37 TAs 194 outcomes	2.0 [1.6 to 2.2]	*p* (Less than daily > Once per day) > 0.999 *p* (Once per day > More than once per day) = 0.645	Moderate
	Once per day 29 TAs 160 outcomes	1.2 [0.89 to 1.5]		Moderate
	More than once per day 48 TAs 259 outcomes	1.1 [0.71 to 1.5]	*p* (Less than daily > More than once per day) > 0.999	Moderate
Large effects (lower body)	Less than daily 12 TAs 38 outcomes	1.2 [0.71 to 1.6]	*p* (Less than daily > Once per day) = 0.590 *p* (More than once per day > Once per day) = 0.530	Low
	Once per day 10 TAs 33 outcomes	1.1 [0.61 to 1.6]		Low
	More than once per day 36 TAs 187 outcomes	1.1 [0.84 to 1.3]	*p* (Less than daily > More than once per day) = 0.589	Moderate
Large effects (upper body)	Less than daily 25 TAs 156 outcomes	2.2 [1.7 to 2.8]	*p* (Less than daily > Once per day) > 0.999 *p* (More than once per day > Once per day) = 0.752	Low
	Once per day 19 TAs 127 outcomes	1.1 [0.50 to 1.6]		Low
	More than once per day 12 TAs 72 outcomes	1.4 [0.68 to 2.1]	*p* (Less than daily > More than once per day) = 0.966	Low
Small effects (all tendinopathies)	Less than daily 15 TAs 134 outcomes	0.75 [0.56 to 0.95]	*p* (Less than daily > Once per day) > 0.999	Moderate
	Once per day 17 TAs 137 outcomes	0.24 [0.05 to 0.43]	*p* (More than once per day > Once per day) = 0.908	Low
	More than once per day 16 TAs 88 outcomes	0.43 [0.24 to 0.61]	*p* (Less than daily > More than once per day) = 0.992	Moderate
Small effects (lower body)	Less than daily 5 TAs 44 outcomes	0.90 [0.67 to 1.2]	*p* (Less than daily > Once per day) > 0.999	Very low
	Once per day 4 TAs 50 outcomes	0.31 [0.03 to 0.63]	*p* (More than once per day > Once per day) = 0.547	Low
	More than once per day 9 TAs 51 outcomes	0.35 [0.04 to 0.66]	*p* (Less than daily > More than once per day) = 0.989	Very low

continued

TABLE 16 Moderator analyses investigating resistance exercise frequency. Pooled mean values were compared for low frequency (less than daily), moderate frequency (daily) and high frequency (more than daily). Analyses are presented across tendinopathies (all/upper body/lower body) and outcome domains (large effect/small effect) (*continued*)

Moderator		Estimate of mean [95% CrI]	Probability	Strength of evidence
Small effects (upper body)	Less than daily 13 TAs 87 outcomes	0.55 [0.33 to 0.79]	*p* (Less than daily > Once per day) = 0.981	Moderate
	Once per day 29 TAs 160 outcomes	0.22 [0.02 to 0.43]	*p* (More than once per day > Once per day) = 0.948	Low
	More than once per day 7 TAs 37 outcomes	0.50 [0.23 to 0.78]	*p* (Less than daily > More than once per day) = 0.618	High

Large effects, effect sizes obtained from outcome domains measuring: disability, pain or function; Small effects, effect sizes obtained from outcome domains measuring: QoL, ROM or physical functional capacity.

following over 25% of exercise therapies (QoL 0.25-quantile small threshold: −0.21 [−0.32 to −0.09]). It is not clear whether these quality-of-life measures necessarily relate to health-related QoL as they are often used interchangeably in the literature. The former construct is a broader concept which covers all aspects of life and therefore may not necessarily correlate with the impact of the treatment. As such, the effect of exercise therapy on global QoL remains equivocal.[104] In stark contrast, efficacy for outcome domains that generally feature patients' subjective assessment of more specific tendinopathy outcomes, for example pain, function, or disability, may be very large, with median standardised effect sizes close to 1, and the most efficacious exercise therapies (e.g. 0.75-quantile) generating standardised effect sizes closer to 1.5. Further research is required to better understand the reasons for the different effect size magnitudes across the outcome domains, the mechanisms of improvement and their relation to potential changes at the tendon.

Efficacy review 1A moderator analyses

As identified in the scoping review, reporting of patient and exercise characteristics is frequently limited in primary studies investigating exercise therapies. A lack of clear, consistent and stratified reporting of patient demographics, including age, race and sex, meant that these factors could not be used in moderator analyses. The most frequently reported characteristics that could be used to explore differences in overall response across the large data set included the duration of assessment from baseline, whether the therapy was supervised or not, and the symptom duration of patients. For assessment duration (time relative to baseline measurement), moderator analyses demonstrated an ordered effect, with the smallest mean pooled effect size obtained for short durations (1.0 [95% CrI 0.87 to 1.1]), and evidence of greater pooled means for medium (1.3 [95% CrI 1.1 to 1.4]) and subsequently long durations (1.4 [95% CrI 1.2 to 1.6]). Whilst the absolute magnitudes of the differences were relatively small and in keeping with previous research investigating differences between short and long-term follow-up,[105] the results provide support that exercise therapies generate lasting improvements. Given the finding that almost all exercise therapies were of short duration (≤12 weeks) and the regenerative time of tendon repair is long[106] it is possible that maintained and even continued improvement over long periods is due to patients maintaining exercise beyond treatment. Since the final stage of tendon repair does not start until 1–2 months after injury and can last over a year,[106] self-management may play an important role in continuing the rehabilitation process through the long tendon remodelling phase once an intervention is finished. Although several barriers to implementation and adherence have been reported, studies suggest that self-management for tendinopathy is feasible with the right support.[107,108] Further exploration of issues surrounding self-management is continued in the mixed-methods review presented in *Chapter 6*.

Moderator analyses also identified an increased efficacy of supervised compared with unsupervised ($\beta_{\text{Unupervised:Supervised0.5}}$ = 0.43 [95% CrI 0.09 to 0.78]) therapies, with the estimated difference increasing after controlling for tendinopathy location and outcome domain ($\beta_{\text{Unupervised:Supervised0.5}}$ = 0.73 [95% CrI 0.41 to 1.1]). A recent systematic review by Hopewell (Hopewell S, Keene DJ, Marian IR, Dritsaki M, Heine P, Cureton L, Dutton SJ, Dakin H, Carr A, Hamilton W, Hansen Z. Progressive exercise compared with best practice advice, with or without corticosteroid injection, for the treatment of patients with rotator cuff disorders (GRASP): a multicentre, pragmatic, 2 × 2 factorial, RCT. *The Lancet* 2021;398(10298):416–28) investigating RCRSP rehabilitation identified that most (6/7) studies showed no differences between supervised and unsupervised exercise. One large RCT found that physiotherapist-led supervised exercise for subacromial pain resulted in greater improvements in pain and disability compared with unsupervised exercise.[109] However, their unsupervised exercise was facilitated only with a leaflet comprising no individualisation or progression. As such, the format of the supervised and unsupervised therapies may influence the results of any comparison. Issues surrounding supervision of exercise therapies are explored in greater depth in the mixed-methods review presented in *Chapter 6*.

Moderator analyses provide some evidence of ordered effect with symptom duration such that the greatest pooled mean effect sizes were generated for studies including patients with the shortest symptom durations ($\beta_{\text{Medium:Short0.5}}$ = 0.47 [95% CrI −0.01 to 0.95]; $\beta_{\text{Long:Short0.5}}$ = 0.67 [95% CrI 0.19 to 1.1]). These results coincide with what would be expected regarding issues of recalcitrant tendinopathies; however, differences were close to zero after controlling for tendinopathy location and outcome domain, suggesting that initial results may have been due to imbalances in these and potentially other covariates. Across the moderator analyses the strength of evidence was judged between low and moderate due to consistent small-study effects creating positive skews to effect size estimates and imprecision in estimates.

Efficacy review 1B main findings

In combination with relatively large changes in commonly measured outcome domains, the findings from efficacy review 1B demonstrated that exercise therapies are generally rated positively on patient-centred and more holistic outcomes. Unlike conventional patient-reported outcomes where the constructs of measurement (such as disability, function, or QoL) can be more easily defined, the measurement of patient satisfaction and perceptions of change are often complex.[110] Patients may have differing levels of satisfaction with the process and outcome of their care based on a range of contextual factors including initial expectations, patient experience and socioeconomic status.[110,111] Additionally, patient experience is likely to reflect a range of aspects of care as perceived by the patient, including accessibility, waiting times and interactions with health workers. In efficacy review 1B, the patient-centred outcomes synthesised included satisfaction and perception of change. Meta-analysis of binary patient satisfaction data taken from studies investigating the Achilles (seven outcomes), patellar (six outcomes), elbow (four outcomes) and RCRSP (two outcomes) generated a pooled estimate indicating that over 70% of patients report positive satisfaction (0.72 [95% CrI 0.55 to 0.88]). The most common scales used to quantify patients' rating of their overall condition were GROC scales typically comprising 15 integer values ranging from −7 (great deal worse) to +7 (great deal better). Meta-analysis of GROC scales (12 outcomes from RCRSP and 5 outcomes for the patellar) generated a pooled estimate of $ES_{0.5}$ = 0.52 [95% CrI 0.39 to 0.65], indicating that patients tended to rate their change approximately half-way up the positive scale. The strength of evidence assessment for both patient satisfaction and GROC outcomes was high.

Efficacy review 1C main findings

Analysis across the exercise-only therapies identified that resistance exercise was the dominant class in over 70% of treatments and outcomes extracted. This level of disparity was expected given the results of the scoping review and discussions with stakeholders regarding the predominance of resistance exercise and the focus of many clinicians regarding perspectives around the need to load tendons with a sufficient mechanical stimulus to obtain positive responses. Given this focus on resistance exercise and the potential to more accurately quantify training dose (e.g. intensity, volume and frequency) with this mode compared with for example flexibility or proprioceptive exercises, attempts to investigate dose–response relationships were restricted to therapies where resistance exercise was the dominant class. One of the limitations of this part of the review was the lack of clear reporting of exercise dose in the literature. Exercise volume and frequency were relatively well-reported, but intensity reporting was poor. None of the studies using TheraBands for resistance provided any information on the resistances encountered or detailed progression in intensity. Similarly, many of the studies that used dumbbells or weighted backpacks did not report the actual mass of the loads used. Given these limitations, resistance intensity was categorised based on the use of body mass only resistance (low intensity) or the addition of external sources of resistance (high intensity).

Efficacy review 1C moderator analyses

Despite limitations in the quantity and quality of data describing the exercise dose, the results of the meta-regressions identified plausible trends that align with frequent recommendations of resistance exercise for both the general population and those with tendinopathies. In general, results were consistent in estimating greater pooled means for higher-intensity resistance exercise, with increases of 0.2 to 0.5 for the large effect outcome domains. Performing exercises less frequently throughout the week (less than once per day) was also consistently shown to produce greater pooled mean effect sizes compared with therapies prescribing exercise once per day or more than once per day. Resistance exercise causes microtrauma in the tendon tissue and therefore requires a period of recovery before performing the next session.[112,113] Furthermore, for hypertrophy of the musculotendinous unit the stimulus from resistance exercise requires full activation, which would be optimised with adequate rest between exercise sessions.[112,113] In contrast, comparisons of exercise volume were less consistent, with many comparisons estimating minimal differences between lower- or higher-volume therapies based on the number of exercises performed or the total number of repetitions performed in the primary exercise. Strength of evidence across the moderator analyses was judged between low and moderate due to the existence of consistent small-study effects and a frequent lack of precision.

Summary and limitations of efficacy review 1

This large review and extensive series of meta-analyses were successful in exploring the exercise-only data to investigate the efficacy of exercise therapies for the management of tendinopathy. The results have shown that large changes from baseline should be expected, and that the distribution is likely to be influenced by a range of factors, including the outcome domain measured, the assessment duration, whether the exercise therapy is supervised or not and potentially the length of patients' symptoms. In addition, the results show that in general patients are satisfied with exercise-only therapies and perceive the changes that occur during therapy to be adequate. It is likely that the efficacy of exercise therapies can be improved by altering the exercise dose and, when using predominantly resistance exercise, by ensuring the intensity is appropriately strenuous and by limiting training frequency. However, with large modelling analyses such as those presented here, there is the potential for substantive findings to be 'cancelled out', and for confounding when comparing effects across different levels of potential moderators to bias results. In many cases there were insufficient data and reporting of factors that may have been useful in attempts to control for confounding. In addition, where sufficient data exist to perform moderator analyses, often there are limitations in the selection and categorisation of moderators in representing the construct of interest. For example, in the present review resistance intensity was categorised as either low or high based on whether exercises were performed solely with body mass or the addition of an external resistance, respectively. This simplification was made as most studies did not specify resistances in terms of an absolute magnitude or percentage of maximum, and it was judged that in many instances the addition of an external resistance would decrease the number of repetitions that could be performed and therefore increase the intensity of the exercise. Given the importance of resistance exercise as a therapy for tendinopathy management, it is of great importance that future research provides more detailed accounts of the resistances used so that better understanding can be obtained of the role of intensity and its interaction with other dose components, including training volume and frequency. As a result of these limitations, caution is required when interpreting the results from this review. In addition, the use of exercise-only data in the absence of control groups can introduce bias, as it is possible that similar (or potentially greater) results could have been achieved with no exercise. The strength of evidence assessments frequently highlighted the high risk of bias due to small-study effects and the potential for extremely large and therefore unlikely estimates to bias results.

Efficacy review 2

The purpose of this review was to quantify the comparative efficacy of different exercise therapies and, where possible, develop an efficacy hierarchy while considering factors such as tendinopathy location. Comparative efficacy was established by comparing therapies based on exercise classes and treatments using direct head-to-head comparisons, and where possible combined direct and indirect comparisons using network meta-analyses.

Review-specific methods

The inclusion criteria were influenced by the project aims, the results of our initial scoping review mapping the exercise and tendinopathy literature as well as stakeholder workshops.

Participants

This meta-analysis included people of any age or gender with a diagnosis of RC-related shoulder pain (RCRSP), lateral elbow, patellar, Achilles or gluteal tendinopathy of any severity or duration. Studies that included participants with tendinopathy in the absence of full thickness or large tears were included.

Intervention

The health technology being assessed is exercise therapy for the treatment of any tendinopathy. Exercise therapies considered for inclusion comprised five therapy classes: (1) resistance; (2) plyometric; (3) vibration; (4) flexibility and (5) proprioception (see *Appendix 4* for definitions). To enable more detailed comparisons, dominant treatments (see *Appendix 4*) were also defined by sub-categorising resistance (eccentric-only, concentric-only, concentric and eccentric, isokinetic, isometric), flexibility (static, dynamic, PNF and ballistic) and proprioception (sense of joint position and force, movement pattern retraining and balance). Interventions combining exercise with other therapies (e.g. laser, shockwave, MT or injection) were not included.

Comparator

The review included studies that compared at least two exercise therapies comprising different classes or treatments to enable calculation of comparative pairwise effect sizes.

Outcomes

Based on the results of our initial scoping review and subsequent stakeholder workshops we included outcome measures from six domains including (1) disability; (2) pain (either on loading, over a specified time, or without further specification); (3) physical functional capacity; (4) function; (5) QoL and (6) ROM (for shoulder joint and RCRSP only). Definitions of each domain and example measurement tools are presented in *Appendix 4*.

Statistical analysis

We fitted class-level and treatment-level Bayesian models. Standardised mean difference pairwise effect sizes were calculated by first identifying a comparator level (e.g. flexibility) and a reference level (e.g. resistance) and subtracting the two change scores. Change scores were calculated by subtracting baseline values from subsequent measurements following the initiation of treatment. Where required, the differences in change scores were reflected by multiplying by −1 to ensure that positive values represented greater improved clinical effect in the comparator compared with the reference. The differences in change scores were then standardised by dividing by the pooled baseline standard deviation (e.g. a value of 0 representing equivalence between comparator and reference). Currently a range of statistical approaches have been developed to best synthesise complex and heterogeneous data including the use of hierarchical models and network meta-analyses (NMA).[110] The use of NMA is increasing due to several potential advantages including the ability to combine direct and indirect estimates of treatment efficacy to enhance precision of estimates.[114] In addition, NMAs may be most effective in areas such as the one considered in the present analysis where there are multiple common treatment options, and an overall hierarchy is unclear. Analyses in this review were first performed by combining all tendinopathies and outcome domains. Subsequent sub-analyses were then performed by isolating tendinopathy locations and outcome domains. To account for the inclusion of multiple data points, hierarchical models were conducted for both direct pair-wise comparisons and NMAs.[115] Analyses were only conducted where at least 10 data points were available[116] from a minimum of two studies and for nodes with a minimum of two edges. Results were reported for NMAs only when all parameters converged to appropriate estimates. To summarise potential differences between different classes and different treatments, results from the network meta-analysis (NMA) were used to calculate the surface under the cumulative ranking curve (SUCRA).[117] For each level within the class or treatment models, a SUCRA value expressed as a percentage was calculated representing the likelihood that outcomes were maximised or near maximised relative to other levels. This provided a means of ranking the different classes and treatments. Analyses were performed using the R packages R2WinBUGS.

Results

Study selection

Of the 204 studies identified for the overall review, an additional 167 studies were excluded due to studies not including different exercise-only treatments arms (163 studies), including the wrong outcome (2 studies), including the wrong tendinopathy location (1 study) and not including the required data (1 study). A total of 37 studies were included comprising 24 pairwise comparisons of different dominant exercise classes, 31 pairwise comparisons of different complete exercise classes and 44 pairwise comparisons of different dominant treatments.

Risk of bias

Risks of bias expressed for each of the 37 studies (31 RCTs and 6 quasi-experimental) included in the review are presented in *Appendix 6* (see *Table 54*). Summaries expressed in percentages are presented in *Table 17*. For RCTs, risk of bias was highest for other biases (29% high risk of bias), blinding of participants (24% high risk of bias) and incomplete outcome bias (11% high risk of bias). For quasi-experimental trials, risk of bias was also highest for other biases (67% high risk of bias). In addition, the clarity of reporting was less effective for quasi-experimental trials with high levels of unclear risk reported for the blinding of outcome assessors (83%) and selective reporting bias (100%).

Dominant exercise class comparison

Fifteen studies comprising 24 head-to-head comparisons of four dominant therapy classes (resistance, flexibility, proprioception and vibration) were identified (see *Figure 13* and *Table 18*). The comparisons included data from 951 participants primarily from studies investigating RCRSP and Achilles tendinopathies, with most comparisons including resistance- and flexibility-dominated exercise classes. Full details of number of studies, tendinopathy locations and outcome domains for each analysis are presented in *Appendix 6*, *Table 55*. Based on the available data, meta-analyses were restricted to comparisons between resistance, flexibility and proprioception, with consistent findings obtained between the NMA analysis and direct pairwise comparisons. Pooling data across all tendinopathies and outcomes for the NMA analysis provided stronger evidence of the superiority of flexibility ($ES_{Resistance:Flexibility0.5}$ = 0.18 [95% CrI 0.07 to 0.29], SUCRA = 0.75) and weaker evidence of the superiority of proprioceptive ($ES_{Resistance:Proprioceptive0.5}$ = 0.16 [95% CrI −1.8 to 0.32], SUCRA = 0.50) classes compared to resistance (SUCRA = 0.25) exercise. All direct pairwise comparisons returned median point estimates indicating greater treatment effects for flexibility and proprioceptive classes compared with resistance

TABLE 17 Efficacy review 2 risk of bias assessment for RCTs (top; *N* = 31) and non-randomised trials (bottom; *N* = 6) with percentages of low-, unclear- and high-risk evaluations expressed relative to the number of TAs (upper value) and the total number of data points (lower value)

		Random Sequence Allocation	Allocation concealment	Blinding of participants	Blinding of outcome assessors	Incomplete outcome bias	Selective reporting	Other bias
Randomised Controlled Trials	Low Risk	65% 53%	62% 53%	37% 39%	79% 78%	70% 70%	32% 49%	65% 64%
	Unclear	24% 33%	35% 45%	40% 34%	17% 16%	19% 22%	60% 47%	6% 7%
	High Risk	11% 14%	3% 3%	24% 27%	3% 6%	11% 8%	8% 4%	29% 29%
Non-Randomised Controlled Trails	Low Risk	NA	NA	33% 69%	17% 17%	100% 100%	0% 0%	17% 29%
	Unclear	NA	NA	50% 25%	83% 83%	0% 0%	100% 100%	17% 29%
	High Risk	NA	NA	17% 6%	0% 0%	0% 0%	0% 0%	67% 42%

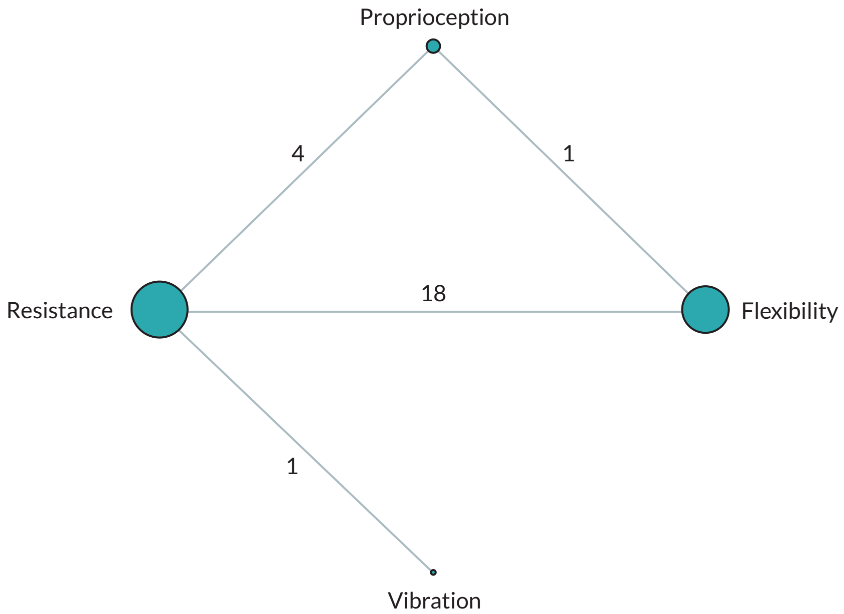

FIGURE 13 Network diagram illustrating distinct and direct pairwise comparisons between dominant exercise therapy classes.
The size of each node is scaled to the number of pairwise comparisons. Values on each edge quantify the number of direct pairwise comparisons between nodes.

exercise (see *Table 19*). Strength of evidence assessments was most frequently low or very low due primarily to consistent risk of imprecision and inconsistency (see *Appendix 6*, *Table 56*).

TABLE 18 Detailed account of pairwise comparison network between dominant exercise therapy classes

Tendinopathy location	Treatment comparisons (%)	Outcome domain	Treatment comparisons (%)	Number of outcomes (%)
RCRSP	11 (45.8)	Disability	24 (100)	77 (32.6)
Achilles	10 (41.7)	Pain	17 (70.8)	72 (30.5)
Elbow	2 (8.3)	PFC	7 (29.2)	43 (18.2)
Patellar	1 (3.8)	ROM	4 (16.7)	32 (13.6)
		QoL	2 (8.3)	10 (4.2)
		Function	2 (8.3)	2 (0.8)

TABLE 19 Direct pairwise comparisons of dominant exercise therapy classes with resistance-only exercise set as reference. Positive/negative values indicated superiority/inferiority relative to resistance exercise

Resistance vs. flexibility effect size [95% CrI]	Strength of evidence	Resistance vs. proprioception effect size [95% CrI]	Strength of evidence	Outcome domains	Tendinopathy
0.08 [−0.19 to 0.36] 5 studies/ 6 comparisons/ 79 outcomes	Very low	0.13 [−0.56 to 0.92] 4 studies/ 4 comparisons/ 68 outcomes	Very low	All	RCRSP
0.07 [−0.44 to 0.56] 5 studies/ 6 comparisons/ 21 outcomes	Very low	0.15 [−0.39 to 0.73] 4 studies/ 4 comparisons/ 18 outcomes	Low	Disability	RCRSP
0.23 [−0.79 to 1.3] 3 studies/ 3 comparisons/ 21 outcomes	Very low	0.22 [−0.77 to 1.4] 3 studies/ 3 comparisons/ 15 outcomes	Very low	Pain	RCRSP
0.33 [−2.3 to 2.5] 2 studies/ 2 comparisons/ 11 outcomes	Very low	0.02 [−1.3 to 1.5] 2 studies/ 2 comparisons/ 23 outcomes	Low	PFC	RCRSP
0.15 [−0.47 to 0.77] 2 studies/ 2 comparisons/ 16 outcomes	Very low	Insufficient data	–	ROM	RCRSP
0.27 [0.11 to 0.46] 2 studies/ 9 comparisons/ 63 outcomes	Moderate	Insufficient data	–	All	Achilles
0.28 [0.01 to 0.63] 2 studies/ 9 comparisons/ 31 outcomes	Low	Insufficient data	–	Disability	Achilles

RCRSP, rotator cuff-related shoulder pain; ROM, ROM shoulder only.
Table includes all comparisons with sufficient data. Checklist of studies, comparisons and outcomes across all tendinopathy and outcome combinations is presented in Appendix 6.

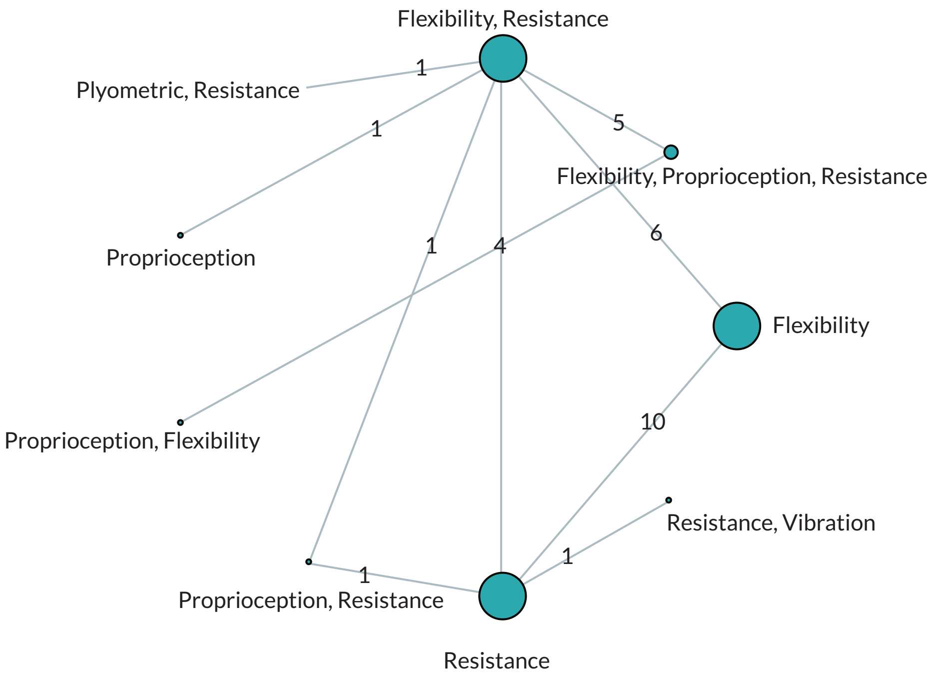

FIGURE 14 Network diagram illustrating distinct and direct pairwise comparisons between complete exercise therapy classes.
The size of each node is scaled to the number of pairwise comparisons. Values on each edge quantify the number of direct pairwise comparisons between nodes.

TABLE 20 Detailed account of pairwise comparison network between complete exercise therapy classes

Tendinopathy location	Treatment comparisons (%)	Outcome domain	Treatment comparisons (%)	Number of outcomes (%)
RCRSP	12 (38.7)	Disability	26 (83.9)	84 (30.3)
Achilles	12 (38.7)	Pain	22 (71.0)	89 (32.1)
Elbow	4 (12.9)	PFC	11 (35.5)	66 (23.8)
Patellar	2 (6.5)	ROM	3 (9.7)	20 (7.2)
Gluteal	1 (3.2)	QoL	2 (6.5)	10 (3.6)
		Function	5 (16.1)	8 (2.9)

Complete exercise class comparison

When comparing unique combinations of all exercise classes included in the exercise therapy (complete class), 21 studies comprising 31 head-to-head comparisons were identified (see *Figure 14* and *Table 20*). The comparisons included data from 1210 participants primarily from studies investigating RCRSP and Achilles tendinopathies, with most comparisons between the complete classes of resistance-only, flexibility-only and combined resistance and flexibility. Full details of number of studies, tendinopathy locations and outcome domains for each analysis are presented in *Appendix 6* and *Table 57*. Based on the available data, meta-analyses were restricted to comparisons between these three complete classes, with consistent findings obtained between the NMA analysis and all direct pairwise comparisons. Pooling data across all tendinopathies and outcomes for the NMA analysis provided stronger evidence of the superiority of flexibility ($ES_{Resistance:Flexibility0.5}$ = 0.17 [95% CrI −0.04 to 0.40], SUCRA = 0.72) and weaker evidence of the superiority of combing flexibility and resistance ($ES_{Resistance:Flexibility+Resistance0.5}$ = 0.04 [95% CrI −1.9 to 2.2], SUCRA = 0.50) compared to resistance (SUCRA = 0.28) exercise. All but a single direct pairwise comparison investigating pooled and distinct outcome domains for RCRSP and Achilles tendinopathies returned median point estimates indicating greater treatment effects for flexibility and combined flexibility and resistance exercise compared with resistance-only exercise (see *Table 21*). Strength of evidence assessments were frequently low or very low due primarily to consistent risk of imprecision and inconsistency (see *Appendix 6*, *Table 58*).

Dominant treatment comparison

Thirty-four studies comprising 44 head-to-head comparisons of 11 dominant treatments (resistance: concentric and eccentric, eccentric-only, concentric-only, isokinetic and isometric; flexibility: dynamic, static and PNF; proprioception: movement pattern retraining and joint position sense; and vibration) were identified. The comparisons comprised data from 1769 participants primarily from studies investigating resistance training treatments (see *Figure 15* and *Table 22*). Full details of number of studies, tendinopathy locations and outcome domains for each analysis are presented in *Appendix 6*, *Table 59*. Given the data available and the sparsity of the overall network, comparisons were restricted to the resistance exercise treatments (concentric and eccentric, eccentric-only, concentric-only and isometric actions). However, the NMA did not converge, and analyses were restricted to direct pairwise comparisons with eccentric-only treatments, which were most popular, used as the reference. In general, CrIs from effect sizes were wide; however, median estimates across all combinations of outcome

TABLE 21 Direct pairwise comparisons of complete exercise therapy classes with resistance-only exercise set as reference. Positive/negative values indicated superiority/inferiority relative to resistance-only exercise

Resistance-only vs. flexibility-only Effect size [95% CrI]	Strength of evidence	Resistance-only vs. resistance + flexibility Effect size [95% CrI]	Strength of evidence	Outcome domains	Tendinopathy
0.23 [0.08 to 0.41] 3 studies/ 10 comparisons/ 77 outcomes	Moderate	0.14 [−1.4 to 1.4] 3 studies/ 4 comparisons/ 26 outcomes	Very low	All	All
0.22 [−0.04 to 0.59] 3 studies/ 10 comparisons/ 35 outcomes	Low	Insufficient data	–	Disability	All
0.24 [0.03 to 0.45] 2 studies/9 comparisons/ 3outcomes	Moderate	Insufficient data	–	Pain	All
Insufficient data	–	−0.82 [−2.3 to 0.35] 2 studies/ 2 comparisons/ 15 outcomes	Very low	PFC	All
0.27 [0.11 to 0.46] 2 studies/9 comparisons/ 63 outcomes	Moderate	Insufficient data	–	All	Achilles
0.28 [0.00 to 0.63] 2 studies/9 comparisons/ 31 outcomes	Low	Insufficient data	–	Disability	Achilles

QoL, quality of life; ROM, range of motion shoulder only.
Table includes all comparisons with sufficient data. Checklist of studies, comparisons and outcomes across all tendinopathy and outcome combinations is presented in *Appendix 6*.

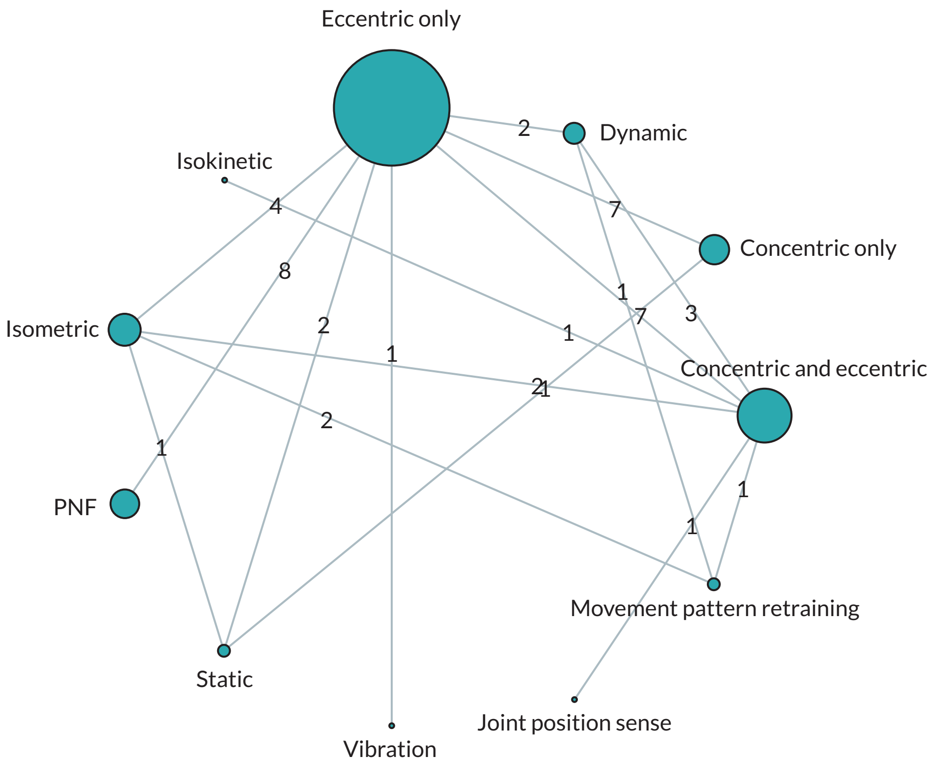

FIGURE 15 Network diagram illustrating distinct and direct pairwise comparisons between dominant exercise therapy treatments.
The size of each node is scaled to the number of pairwise comparisons. Values on each edge quantify the number of direct pairwise comparisons between nodes.

domains and tendinopathy types were consistent, indicating greater treatment effects for concentric and eccentric actions compared with eccentric-only (see *Table 23*), and reduced treatment effects for isometric and concentric-only actions compared with eccentric-only. Strength of evidence assessments were most frequently low or very low due primarily to consistent risk of imprecision and inconsistency (see *Appendix 6*, *Table 60*).

Efficacy review 2 discussion

The aim of efficacy review 2 was to synthesise data from studies directly comparing different exercise classes and exercise treatments to quantify comparative efficacy for the management of the most common tendinopathies. Based on this aim, only studies that included TAs featuring exercise in isolation (e.g. not combined with electro-therapy or MT) were included and compared. In addition, to generate pairwise comparisons the TAs within the same study were required to compare different exercise-only therapies with regard to the class or treatment. Whilst this process limited the number of studies that could be included in the analysis, it provided the most effective means of comparing exercise therapies across the research base to identify whether general patterns and a treatment hierarchy could be established.

Therapy class analysis and RCRSP comparisons

The initial broad NMA analysis comparing dominant therapy classes across all tendinopathies and outcomes (24 direct treatment comparisons) provided evidence that flexibility was superior to resistance exercise in the available comparisons. Subsequent analyses comprising direct pairwise comparisons only further supported the NMA results, providing limited but consistent evidence that both flexibility and

TABLE 22 Detailed account of pairwise comparison network between dominant exercise therapy treatments

Tendinopathy location	Treatment comparisons (%)	Outcome domain	Treatment comparisons (%)	Number of outcomes (%)
RCRSP	14 (31.8)	Disability	38 (86.4)	108 (28.2)
Achilles	15 (34.1)	Pain	29 (65.9)	114 (29.8)
Elbow	8 (18.2)	PFC	18 (40.9)	93 (24.3)
Patellar	6 (13.6)	ROM	6 (13.6)	37 (9.7)
Gluteal	1 (2.3)	QoL	3 (6.8)	19 (5.0)
		Function	8 (18.2)	12 (3.1)

TABLE 23 Direct pairwise comparisons of dominant exercise therapy classes with resistance exercise set as reference. Positive/negative values indicated superiority/inferiority relative to eccentric-only resistance exercise

Eccentric-only vs. concentric and eccentric Effect size [95% CrI]	Strength of vidence	Eccentric-only vs concentric-only Effect size [95% CrI]	Strength of evidence	Eccentric-only vs isometric Effect size [95% CrI]	Strength of evidence	Outcome domains	Tendinopathy
0.48 [−0.13 to 1.1] 6 studies/ 7 comparisons/ 56 outcomes	Low	−0.76 [−1.7 to 0.15] 7 studies/ 7 comparisons/ 57 outcomes	Very low	−1.7 [−3.2 to −0.05] 4 studies/ 4 comparisons/ 16 outcomes	Very low	All	All
0.18 [−0.45 to 0.67] 5 studies/ 6 comparisons/ 14 outcomes	Low	Insufficient data	–	Insufficient data	–	Disability	All
1.0 [−1.2 to 3.1] 3 studies/ 4 comparisons/ 17 outcomes	Very low	−0.22 [−0.96 to 0.64] 4 studies/ 4 comparisons/ 23 outcomes	Very low	Insufficient data	–	PFC	All
0.62 [0.01 to 1.2] 5 studies/ 6 comparisons/ 14 outcomes	Low	−0.85 [−1.8 to 0.05] 6 studies/ 6 comparisons/ 15 outcomes	Very low	Insufficient data	–	Pain	All
Insufficient data	–	−1.0 [−2.8 to 0.60] 3 studies/ 3 comparisons/ 17 outcomes	Low	Insufficient data	–	ALL	Achilles
Insufficient data	–	−0.06 [−0.66 to 0.59] 2 studies/ 2 comparisons/ 31 outcomes	Low	Insufficient data	–	ALL	Elbow
0.07 [−0.54 to 1.1] 2 studies/ 2 comparisons/ 30 outcomes	Low	Insufficient data	–	Insufficient data	–	ALL	RCRSP

TABLE 23 Direct pairwise comparisons of dominant exercise therapy classes with resistance exercise set as reference. Positive/negative values indicated superiority/inferiority relative to eccentric-only resistance exercise (*continued*)

Eccentric-only vs. concentric and eccentric Effect size [95% CrI]	Strength of vidence	Eccentric-only vs concentric-only Effect size [95% CrI]	Strength of evidence	Eccentric-only vs isometric Effect size [95% CrI]	Strength of evidence	Outcome domains	Tendinopathy
Insufficient data	–	−0.25 [−0.90 to 0.40] 2 studies/ 2 comparisons/ 11 outcomes	Low	Insufficient data	–	Pain	Elbow
0.60 [−0.58 to 1.6] 2 studies/ 2 comparisons/ 13 outcomes	Low	Insufficient data	–	Insufficient data	–	PFC	RCRSP

RCRSP, rotator cuff-related shoulder pain; ROM, ROM shoulder only.
Table includes all comparisons with sufficient data. Checklist of studies, comparisons and outcomes across all tendinopathy and outcome combinations are presented in *Appendix 6*.

proprioceptive dominant treatments were superior to resistance when outcome domains were combined or analysed separately. Data for the analyses were taken primarily from studies investigating RCRSP (five studies and six comparisons). The findings of superior efficacy of flexibility and proprioceptive exercise therapies for management of RCRSP should be considered in context of the low and very low quality of evidence used in their generation; however, they do support recent recommendations.[118–122] The pathoetiology of RCRSP is multifactorial and can be attributed to intrinsic, extrinsic or even combined mechanisms.[123,124] Due to this varied nature of the factors involved, RCRSP is not a homogeneous entity and hence may require treatment interventions that consider these specific mechanisms.[124] The primary intervention for RCRSP is generally active exercise therapy, with flexibility treatments, especially those targeting the pectoralis minor commonly prescribed to reduce anterior tilting of the scapula, which decreases the joint space available for the supraspinatus tendon.[125] Additionally, interventions for RCRSP frequently include proprioceptive exercise to restore normal shoulder movement patterns, designed to address degenerated tendons, altered scapular kinematics or abnormal neuromuscular control.[119,126,127] These proprioceptive mechanisms would use the range gained from pectoralis minor stretching to alter scapular kinematics. However, the strength of the evidence for the superiority of flexibility and proprioceptive exercise compared with resistance for RCRSP was judged as low and very low due to high risk of inconsistency, imprecision in estimates and clear evidence of small-study effects with a small number of studies generating very large effect sizes.

Achilles therapy class comparisons

Evidence which must be interpreted with great caution was also obtained indicating superiority of flexibility as the dominant therapy class for AT. The degree of caution is because the evidence comprised only a small amount of data (two studies and nine comparisons) and was judged to be of moderate effect and low quality due to inconsistency and imprecision. Although this finding may seem contrary to the focus and conclusions of research conducted on AT, there remain alternative potential mechanisms of exercise interventions relating to different pathoanatomical diagnosis (e.g. insertional, mid-portion AT) yet to be understood. Studies rarely report the severity and irritability of AT, and therefore the sample population may be at different points along the reactive-degenerative tendon continuum.[128] Flexibility exercises to encourage ROM could be indicated in a painful reactive tendon, where traditional eccentric loading programs might not be tolerated. As such, it is likely that the most beneficial exercise therapies require targeting to the individual, the stage of pathology and functional demands of the patient.

Therapy treatment analysis

When synthesising pairwise comparisons of dominant treatments, data were primarily obtained between resistance modalities including concentric and eccentric, isometric, concentric-only and eccentric-only exercises. The NMA analysis did not converge with the majority of pairwise effect size estimates, returning unfeasibly large CrIs. However, subsequent analyses only comprising direct comparisons provided limited but consistent evidence of a hierarchy where therapies comprising concentric and eccentric repetitions as the dominant treatment were superior to eccentric-only. In addition, therapies comprising eccentric-only repetitions as the dominant treatment were shown to be superior to treatments comprising concentric-only or isometric actions. Most of the studies included in this review recruited patients from the general population. In contrast, much of the previous and influential research demonstrating the efficacy of eccentric-only treatments for tendinopathy management were conducted with performance and recreational athletes.[129–132] The effect of pain and functional outcomes can be conflicting in the literature when comparing eccentric exercise with other exercise modalities.[12] There could be an element of pain tolerance with regard to how well eccentric-only exercises are tolerated in both general and athletic populations, the latter generally more inclined to higher loading and possibly discomfort during activity. Visnes *et al*.[129] reported poor tolerance of eccentric-only exercises amongst athletes in season with patellar tendinopathy due to excessive loading from sport. Additionally, Bahr *et al*.[131] reported a 40% drop-out from their eccentric protocol in recreational athletes with chronic tendinopathy, therefore additional factors such as adherence, attendance and fidelity (discussed in *Chapter 6*) may also influence any differences between treatments.

While it is known that the tendon is responsive to loading and will respond better to an optimum load beyond which further damage can occur,[9] there is less certainty that the mode of muscle contraction for a given load can have a differential effect on the biochemical and biomechanical structures (e.g. collagen synthesis) of the tendon.[133,134] Given greater internal forces can be generated during eccentric compared with concentric actions, it is believed that this enhanced force and associated stretching have greater potential for mechanical stimulation.[135–137] However, it has been argued that this potential increase in capacity is rarely applied clinically as rehabilitation exercises seldom perform eccentric 1-repetition maximums but rather involve movements such as eccentric squats and heel drops with resistances targeting 15-repetition maximums.[132,138] In a comparative study of concentric and eccentric contraction on quadriceps and patellar tendon, Farup *et al.* (2014) found similar magnitudes of tendon hypertrophy irrespective of the mode of contraction. Their findings suggest that if there is sufficient load on the tendon, the mode of action is inconsequential to cellular and tissue response.[139] It is likely, therefore, that when appropriate loadings are used any differences due to mode of action will be small and challenging for individual studies to identify. The benefits of large meta-analyses such as that conducted here include identification of general patterns that may be of use to clinicians and assist in developing future research questions. Under typical constraints associated with resistance exercise therapies for the general population, the results presented here suggest that combined eccentric and concentric repetitions may present fewer challenges and be the most efficacious for management of tendinopathies.

Summary and limitations of efficacy review 2

It is important to highlight that there are many potential limitations with meta-analyses that combine data from studies with diverse populations, interventions and outcomes. Outcomes of analyses may be influenced by imbalances in effect moderators and generate findings that contradict the underlying treatment effects particular to any desired combination of population, intervention and outcomes. In addition, the present analyses have focussed predominantly on identifying dominant therapy classes and treatments that are in practice frequently combined with non-exercise therapies, including electro-therapy, MT, injections and surgery. With these limitations in mind, the findings of broad meta-analyses such as the one conducted here should be viewed with caution.

From a clinical perspective, the findings of the present study acknowledge that there are limitations to perspectives of the superiority of resistance exercise and in particular eccentric-only resistance exercise.

The findings prompt the consideration of a broader, more holistic approach to the management of tendinopathy that may be tailored to the functional needs of the individual. The principles of loading are very much still supported; however, clinicians and researchers should consider other paradigms of exercises such as flexibility and proprioception that may yield better improvements in certain circumstances which could also have meaningful impact on overall adherence and patient satisfaction. Where resistance exercise is the dominant treatment, the results of the present meta-analysis identify that eccentric-only modalities may produce greater improvements than other contraction modes such as isometric and concentric-only. However, the combination of concentric and eccentric repetitions may produce the greatest improvements, which requires further investigation and consideration of whether the resistances used in many treatments make use of the additional loading potential with eccentric-only actions.

Efficacy review 3

The purpose of this review was to compare the efficacy of exercise, non-exercise and combined therapies to develop a hierarchy where possible. Comparative efficacy was established by comparing therapies based on their class and treatments using direct head-to-head comparisons and where possible combined direct and indirect comparisons using network meta-analyses.

Review-specific methods

The inclusion criteria were influenced by the project aims, the results of our initial scoping review mapping the exercise and tendinopathy literature as well as stakeholder workshops.

Participants

This meta-analysis included people of any age or gender with a diagnosis of tendinopathy of any severity or duration and at any anatomical location. Studies that included participants with tendinopathy in the absence of full thickness or large tears were included.

Intervention

The primary health technology being assessed is exercise therapy for the treatment of any tendinopathy. Exercise therapies considered for inclusion comprised five classes: (1) resistance; (2) flexibility; (3) proprioception; (4) vibration and (5) plyometric (see *Appendix 4* for definitions). No restrictions were placed on the settings in which the exercise therapy was performed or the professionals involved. To be included in the review, studies were required to report sufficient information regarding the exercise intervention to enable appropriate identification of exercise class and quantification of exercise dose.

Comparator

To be included in this review, studies were required to compare at least one exercise TA that met the inclusion criteria with other common therapies used in the management or investigation of tendinopathies. Comparators selected included: (1) non-active (placebo, sham, wait-and-see); (2) electro-therapy (e.g. shockwave, laser, ultrasound, radar); (3) kinetics (e.g. altered loading through taping and braces, or immobilisation through splits); (4) injection therapy (e.g. autologous, drug, volumetric); (5) MT and (6) surgery. Definitions of broad and specific therapy classes for the different therapies are provided in *Appendix 4*.

Outcomes

Based on the results of our initial scoping review and subsequent stakeholder workshops we included outcome measures from six domains: (1) disability; (2) pain (either on loading, over a specified time, or without further specification); (3) physical functional capacity; (4) function; (5) QoL and (6) ROM (for shoulder joint only). Definitions of each domain and example measurement tools are presented in *Appendix 4*.

Statistical analysis

We fitted class-level and treatment-level Bayesian models. For continuous data, standardised mean difference pairwise effect sizes were calculated by first identifying a comparator level (e.g. flexibility) and a reference level (e.g. resistance) and subtracting the two change scores. Change scores were calculated by subtracting baseline values from subsequent measurements following the initiation of treatment. Where required, the differences in change scores were reflected by multiplying by −1 to ensure that positive values represented greater improved clinical effect in the comparator compared with the reference. The differences in change scores were then standardised by dividing by the pooled baseline standard deviation. For binary outcomes, proportional odds models were used to compare reference and comparator levels. Analyses in this review were first performed by combining all tendinopathies and outcome domains. Subsequent sub-analyses were then performed by isolating tendinopathy locations and outcome domains. To account for the inclusion of multiple data points, hierarchical models were conducted for both direct pair-wise comparisons and NMAs.[115] Analyses were only conducted where at least 10 data points were available,[116] including a minimum of two treatment comparisons and nodes with a minimum of two edges. Results were reported for NMAs only when all parameters converged to appropriate estimates. To summarise potential differences between different classes and different treatments, results from the NMA were used to calculate the SUCRA.[117] For each level within the class or treatment models, a SUCRA value expressed as a percentage was calculated representing the likelihood that outcomes were maximised or near maximised relative to other levels. This provided a means of ranking the different classes and treatments. Analyses were performed using the R packages R2WinBUGS[140] and brms.[92] Convergence of parameter estimates was checked with Gelman–Rubin R-hat values.[88,93]

Results

Of the 204 studies identified for the overall review, three studies were excluded for not including sufficient data on the required outcomes. A total of 201 studies comprising 460 TAs and 11,888 participants were identified that met the inclusion criteria. A total breakdown of the tendinopathies investigated across the 201 studies and associated 1863 outcomes measured across six outcome domains are presented in *Table 24*.

Risk of bias

Risks of bias expressed for each of the 201 studies (173 RCTs and 28 quasi-experimental) included in the review are presented in *Appendix 6* (see *Table 61*). Summaries expressed in percentages are presented in *Table 25*. For RCTs, risk of bias was highest for blinding of participants (37% high risk of bias), other biases (32% high risk of bias) and blinding of outcome assessors (14% high risk of bias). For quasi-experimental trials, risk of bias was also highest for other biases (70% high risk of bias). In addition, the clarity of reporting was less effective for quasi-experimental trials, with high levels of unclear risk reported for all domains other than other bias (52–82% unclear risk).

Broad therapy class

The composition of the broad therapy classifications across the 460 TAs included exercise-only (182/39.6%), non-active (18/3.9%), non-exercise-only (36/7.8%), exercise and non-exercise (224/48.7%). The head-to-head comparisons between the broad therapy classifications are illustrated in *Figure 16*, with interventions most frequently combining exercise and non-exercise therapies. Full details of the number of trials and outcomes across the different domains are presented in *Appendix 6*, *Table 62*. Results obtained from NMAs comparing broad therapy classifications across different outcomes identified a consistent pattern (see *Table 26*). In all but one model, the SUCRA and pairwise effect sizes indicated the superiority of interventions combining exercise and non-exercise therapies relative to all other classifications. The only exception was in the analysis of QoL, where combined exercise and non-exercise ranked joint top with non-exercise-only based on SUCRA values. Median effect size estimates

TABLE 24 Efficacy review 3: Tendinopathies and outcome domains investigated

Tendinopathies	Number of studies (%)	Outcome domain	Number of outcomes (%)
RCRSP	87 (43.3)	Pain	545 (29.3)
Elbow	43 (21.4)	Disability	522 (28.0)
Achilles	41 (20.4)	PFC	385 (20.7)
Patellar	20 (10.0)	ROM	233 (12.5)
Gluteal	4 (2.0)	Function	116 (6.2)
Tibialis posterior	4 (2.0)	QoL	62 (3.3)
Hamstring	1 (0.5)		
Biceps	1 (0.5)		

RCRSP, rotator cuff-related shoulder pain; ROM, ROM shoulder only.

TABLE 25 Efficacy review 3: Risk of bias assessment for RCTs (top; *N* = 173) and non-randomised trials (bottom; *N* = 28) with percentages of low-, unclear- and high-risk evaluations expressed relative to the number of TAs (upper value) and the total number of data points (lower value)

		Random Sequence Allocation	Allocation concealment	Blinding of participants	Blinding of outcome assessors	Incomplete outcome bias	Selective reporting	Other bias
Randomised Controlled Trials	Low Risk	76% 78%	65% 69%	33% 35%	66% 67%	65% 72%	31% 38%	58% 59%
	Unclear	20% 17%	32% 28%	30% 28%	21% 19%	24% 18%	66% 60%	9% 9%
	High Risk	4% 6%	3% 3%	37% 37%	14% 14%	11% 10%	3% 2%	32% 33%
Non-Randomised Controlled Trials	Low Risk	NA	NA	21% 24%	38% 39%	48% 51%	18% 27%	12% 14%
	Unclear	NA	NA	67% 67%	59% 58%	52% 49%	82% 73%	18% 18%
	High Risk	NA	NA	13% 8%	3% 3%	0% 0%	0% 0%	70% 68%

indicated that the combination of exercise with non-exercise therapies tended to improve outcomes by effect sizes of approximately 0.1 to 0.3. Less consistency was observed in the treatment hierarchy across the remaining broad therapy classes; however, non-active treatments tended to be ranked lowest. Strength of evidence assessments were low or very low due primarily to consistent risk of imprecision and inconsistency (see *Appendix 6*, *Table 63*).

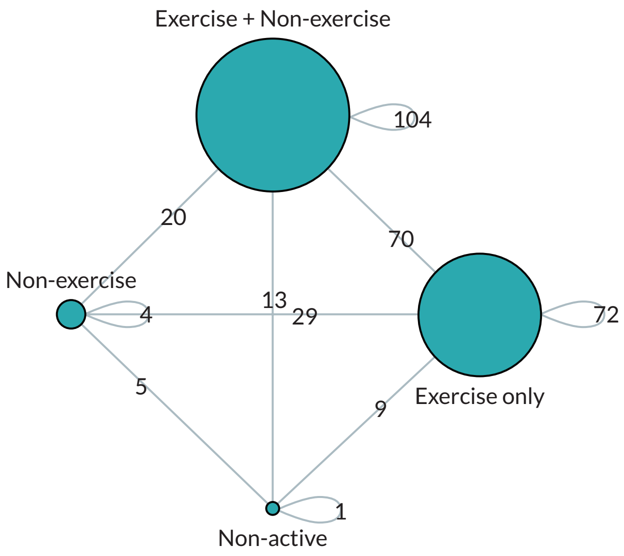

FIGURE 16 Network diagram illustrating distribution of pairwise comparisons between broad therapy classifications. The size of each node is scaled to the number of pairwise comparisons. Values on each edge quantify the number of direct pairwise comparisons between nodes. A total of 327 pairwise comparisons featured 311 instances of exercise + non-exercise, 252 instances of exercise-only, 62 instances of non-exercise-only and 29 instances of non-active.

Dominant class

The composition of dominant therapy classes across the 460 TAs included resistance (212/46.1%), electro-therapy (62/13.5%), flexibility (48/10.4%), injection (31/6.7%), proprioception (27/5.9%), MT (28/6.1%), kinetics (20/4.3%), non-active (19/4.1%), surgery (11/2.4%), vibration (1/0.2%) and plyometrics (1/0.2%). The pairwise comparisons between the dominant therapy classifications are illustrated in *Figure 17* with interventions most frequently focussing on resistance exercise. For the NMA analysis, comparisons including vibration and plyometrics were removed, and analyses restricted to outcome domains where there were sufficient data across the remaining dominant therapy classes. Distributions of SUCRA values are presented in *Figure 18*. When assessing the relative rankings of therapy classes across the different outcomes, substantive overlaps were identified, with limited trends emerging. The highest SUCRA values tended to occur for therapies where injection was the dominant class and the lowest SUCRA values for non-active therapies (see *Figure 18*).

Exercise and non-exercise class combinations

The final analysis was completed across different therapy class combinations (see *Figure 19*) to determine which produced the greatest improvements and build upon the previous results identifying exercise combined with non-exercise treatments were superior to non-active or exercise and non-exercise therapies in isolation. Due to substantial non-convergence in parameter estimates within the NMA, direct pairwise analyses were completed with exercise-only interventions as the reference (see *Table 27*). Full details of the number of trials and outcomes across the different domains are presented in *Appendix 6*, *Table 64*.Substantive uncertainty was identified across outcomes and domains investigated, with wide CrIs for mean pairwise effect sizes. Median estimates indicated similar efficacy for the combination of exercise with either electro-therapy, injection or kinetics. Strength of evidence assessments across the different comparisons were highly variable, but most frequently categorised as low due primarily to consistent risk of imprecision and inconsistency (see *Appendix 6*, *Table 65*).

Efficacy review 3 discussion

The final efficacy review represents the largest quantitative synthesis and NMA to date investigating the management of tendinopathy. The review included 201 studies, 460 TAs and 11888 participants with data collected over nine different tendinopathies. The largest contribution came from RCRSP tendinopathy (43%), with substantial contributions from elbow (21%), Achilles (20%) and patellar (10%) tendinopathies, across a range of outcome domains, with pain (29%) and disability (28%) the most

TABLE 26 Results from network meta-analyses. Positive/negative values indicate superiority/inferiority relative to interventions combining both exercise and non-exercise therapies

Exercise + non-exercise [95% CrI]	Exercise-only [95% CrI]	Non-exercise-only [95% CrI]	Non-active [95% CrI]	Strength of evidence	Outcome domains	Tendinopathy
Reference SUCRA = 0.88 103 trials 909 outcomes	$ES_{0.5}$ = −0.09 [−0.22 to 0.04] SUCRA = 0.48 100 trials 1035 outcomes	$ES_{0.5}$ = −0.13 [−0.46 to 0.19] SUCRA = 0.40 50 trials 450 outcomes	$ES_{0.5}$ = −0.19 [−0.43 to 0.06] SUCRA = 0.23 27 trials 314 outcomes	Low	All	All
Reference SUCRA = 0.81 91 trials 311 outcomes	$ES_{0.5}$ = −0.07 [−0.23 to 0.11] SUCRA = 0.59 90 trials 319 outcomes	$ES_{0.5}$ = −0.10 [−0.50 to 0.31] SUCRA = 0.53 42 trials 111 outcomes	$ES_{0.5}$ = −0.35 [−0.63 to 0.07] SUCRA = 0.07 23 trials 99 outcomes	Low	Disability	All
Reference SUCRA = 0.80 69 trials 282 outcomes	$ES_{0.5}$ = −0.13 [−0.30 to 0.03] SUCRA = 0.70 69 trials 295 outcomes	$ES_{0.5}$ = −0.03 [−0.40 to 0.37] SUCRA = 0.31 36 trials 132 outcomes	$ES_{0.5}$ = −0.21 [−0.51 to 0.09] SUCRA = 0.19 20 trials 69 outcomes	Low	Pain	All
Reference SUCRA = 0.86 32 trials 103 outcomes	$ES_{0.5}$ = −0.18 [−0.57 to 0.21] SUCRA = 0.34 32 trials 155 outcomes	$ES_{0.5}$ = −0.11 [−0.47 to 0.26] SUCRA = 0.56 20 trials 85 outcomes	$ES_{0.}$ = −0.20 [−0.68 to 0.29] SUCRA = 0.23 14 trials 75 outcomes	Low	PFC	All
Reference SUCRA = 0.83 24 trials 68 outcomes	$ES_{0.5}$ = −0.03 [−0.29 to 0.23] SUCRA = 0.72 24 trials 83 outcomes	$ES_{0.5}$ = −0.49 [−1.1 to 0.04] SUCRA = 0.37 13 trials 57 outcomes	$ES_{0.5}$ = −0.19 [−0.47 to 0.08] SUCRA = 0.09 9 trials 42 outcomes	Low	Function	All
Reference SUCRA = 0.57 18 trials 71 outcomes	$ES_{0.5}$ = −0.05 [−0.28 to 0.18] SUCRA = 0.41 18 trials 71 outcomes	$ES_{0.5}$ = 0.09 [−0.37 to 0.54] SUCRA = 0.57 8 trials 25 outcomes	$ES_{0.5}$ = −0.11 [−0.52 to 0.31] SUCRA = 0.32 6 trials 17 outcomes	Very low	QoL	All

Table includes all comparisons where there were sufficient data.

common. The review provides an overall insight into the efficacy of a range of treatment domains in tendinopathy when compared to exercise therapy. Initial analyses were conducted comparing broad therapy classifications of exercise-only, non-exercise-only, exercise plus non-exercise and non-active. Results were consistent across the pooled analysis and individual outcome domains demonstrating the superiority of combining exercise and non-exercise therapies. The SUCRA values (0.57 to 0.88) were highest for combined exercise and non-exercise in all but one comparison (QoL for all tendinopathies), where a tie was identified with non-exercise-only therapies. Median estimates from the comparative pairwise effect sizes indicated improved efficacy of approximately 0.1 to 0.3. These differences suggest a small to moderate added benefit that is likely to be interpreted as clinically significant. These findings are also in line with previous research comprising NMAs, where both van der Vlist *et al.*[141] and Rhim *et al.*[142] ranked exercise training combined with shockwave therapy or injection more favourably than exercise alone for AT.

Following the broadest therapy classifications, analyses were completed comparing dominant exercise and non-exercise classes. Considerable overlap was identified across tendinopathy locations and outcome domains, with non-active therapies tending to rank at the bottom. Considerable overlap may be expected, as many treatments included multiple modalities, and so comparisons based on

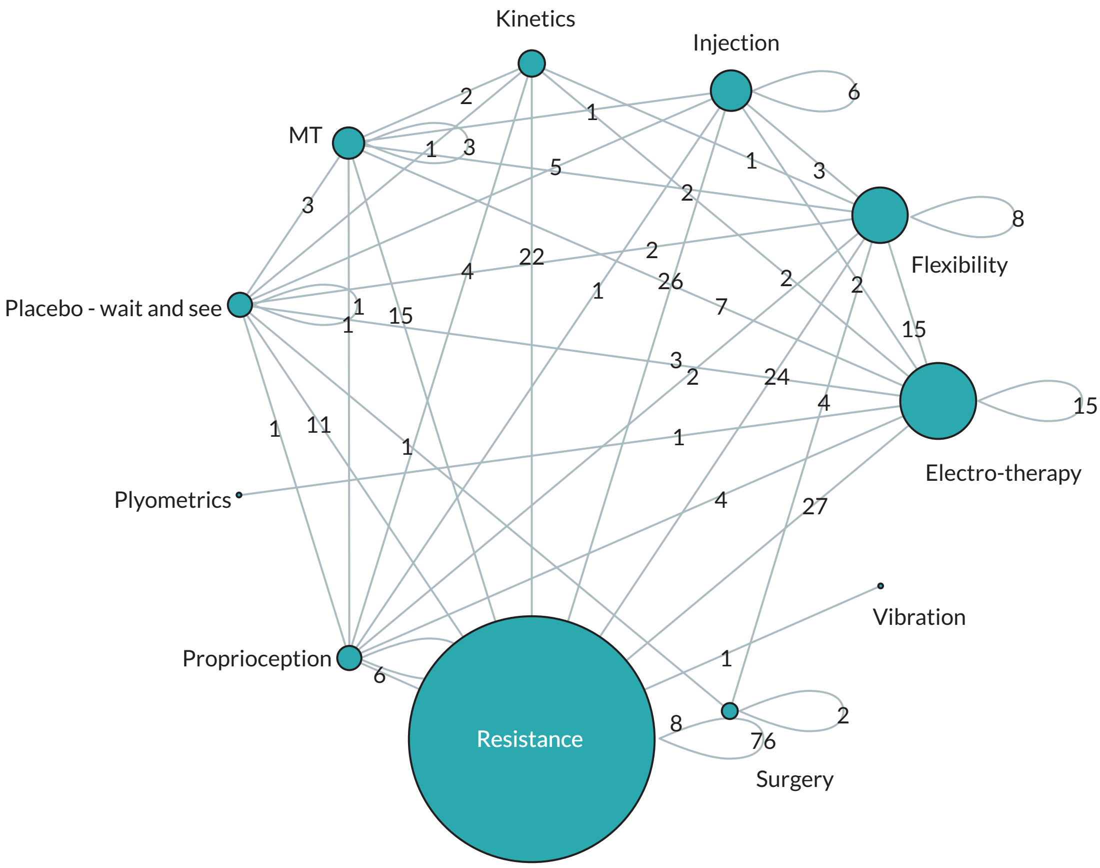

FIGURE 17 Network diagram illustrating distribution of pairwise comparisons between dominant therapy classes. The size of each node is scaled to the number of pairwise comparisons. Values on each edge quantify the number of direct pairwise comparisons between nodes. A total of 327 pairwise comparisons that featured 292 instances of resistance, 91 instances of electro-therapy, 69 instances of flexibility, 50 instances of injection, 32 instances of proprioception, 37 instances of MT, 29 instances of non-active, 32 instances of kinetics, 20 instances of surgery, 1 instance of vibration, and 1 instance of plyometrics.

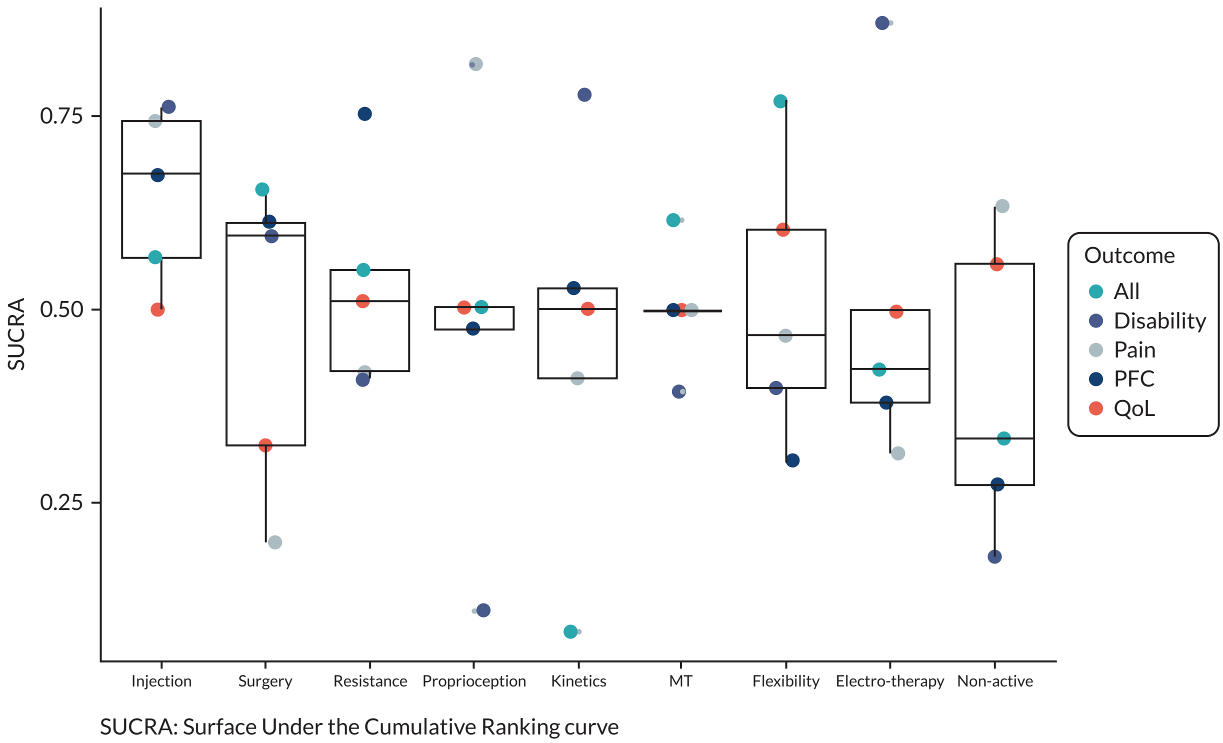

FIGURE 18 Distribution of rankings (SUCRA values) across outcomes and dominant therapy classes.

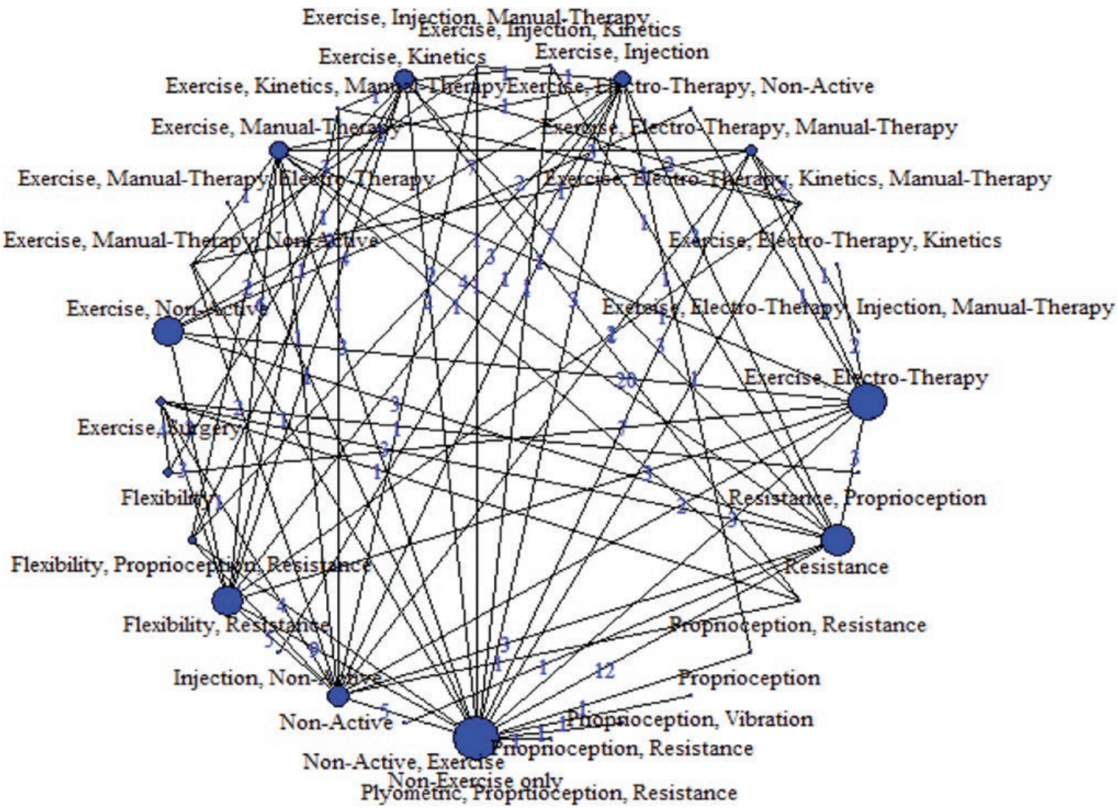

FIGURE 19 Network diagram illustrating distribution of pairwise comparisons between complete therapy classes. The size of each node is scaled to the number of pairwise comparisons. Values on each edge quantify the number of direct pairwise comparisons between nodes. A total of 201 pairwise comparisons that featured 53 instances of non-exercise only, 44 instances of exercise + electro-therapy, 39 instances of resistance, 37 instances of exercise + non-active, 37 instances of flexibility + resistance, 27 instances of non-active, 25 instances of exercise + kinetics, 23 instances of exercise + MT, 21 instances of exercise + injection, 20 instances of exercise + electro-therapy + MT, 13 instances of exercise + surgery, 12 instances of flexibility, 11 instances of flexibility + proprioception + resistance, 7 instances of exercise + electro-therapy + kinetics + MT, 7 instances of exercise + MT + non-active, 4 instances of exercise + kinetics + MT, 4 instances of proprioception + resistance, 3 instances of exercise + electro-therapy + non-active, 3 instances of exercise + injection + kinetics, 2 instances of exercise + electro-therapy + kinetics, 1 instance of exercise + electro-therapy + injection + MT, 1 instance of injection + non-active.

TABLE 27 Direct pairwise comparisons of complete exercise therapy classes with exercise-only set as reference. Positive/negative values indicated superiority/inferiority relative to exercise only

Exercise + electro-therapy [95% CrI]	Exercise + injection [95% CrI]	Exercise + kinetics [95% CrI]	Exercise + surgery [95% CrI]	Exercise + MT [95% CrI]	Exercise + non-active [95% CrI]	Outcome domains	Tendinopathy
$ES_{0.5}$ = 0.31 [−0.21 to 0.88] 12 trials 69 outcomes	$ES_{0.5}$ = 0.46 [0.04 to 0.81] 7 trials 67 outcomes	$ES_{0.5}$ = 0.19 [−0.02 to 0.39] 16 trials 156 outcomes	$ES_{0.5}$ = −0.15 [−0.48 to 0.21] 12 trials 189 outcomes	$ES_{0.5}$ = 0.32 [−0.21 to 0.88] 13 trials 110 outcomes	$ES_{0.5}$ = 0.16 [−0.59 to 0.64] 5 trials 37 outcomes	All	All
Strength of evidence: low	Strength of evidence: moderate	Strength of evidence: moderate	Strength of evidence: low	Strength of evidence: low	Strength of evidence: low		
$ES_{0.5}$ = 0.64 [−0.2 to 1.4] 12 trials 32 outcomes	$ES_{0.5}$ = 0.67 [−0.11 to 1.5] 5 trials 19 outcomes	$ES_{0.5}$ = 0.32 [−0.09 to 0.57] 14 trials 48 outcomes	$ES_{0.5}$ = −0.06 [−0.36 to 0.28] 12 trials 63 outcomes	$ES_{0.5}$ = 0.64 [−0.20 to 1.4] 10 trials 38 outcomes	$ES_{0.5}$ = −0.22 [−0.90 to 0.20] 5 trials 16 outcomes	Disability	All

continued

TABLE 27 Direct pairwise comparisons of complete exercise therapy classes with exercise-only set as reference. Positive/negative values indicated superiority/inferiority relative to exercise only (*continued*)

Exercise + electro-therapy [95% CrI]	Exercise + injection [95% CrI]	Exercise + kinetics [95% CrI]	Exercise + surgery [95% CrI]	Exercise + MT [95% CrI]	Exercise + non-active [95% CrI]	Outcome domains	Tendinopathy
Strength of evidence: very low	Strength of evidence: moderate	Strength of evidence: high	Strength of evidence: low	Strength of evidence: very low	Strength of evidence: moderate		
$ES_{0.5}$ = 0.12 [−0.27 to 0.50] 7 trials 20 outcomes	$ES_{0.5}$ = 0.71 [−0.78 to 1.8] 5 trials 20 outcomes	$ES_{0.5}$ = 0.31 [−0.21 to 0.78] 16 trials 156 outcomes	$ES_{0.5}$ = −0.20 [−0.66 to 0.40] 11 trials 80 outcomes	$ES_{0.5}$ = 0.12 [−0.26 to 0.50] 9 trials 33 outcomes	$ES_{0.5}$ = −0.31 [−2.0 to 1.4] 3 trials 13 outcomes	Pain	All
Strength of evidence: very low	Strength of evidence: moderate	Strength of evidence: very low	Strength of evidence: very low	Strength of evidence: low	Strength of evidence: low		
Insufficient data	Insufficient data	$ES_{0.5}$ = 0.15 [−0.36 to 0.61] 5 trials 23 outcomes	Insufficient data	$ES_{0.5}$ = −0.02 [−1.3 to 1.1.3] 3 trials 12 outcomes	Insufficient data	PFC	All
		Strength of evidence: very low		Strength of evidence: low			
Insufficient data	Insufficient data	$ES_{0.5}$ = −0.08 [−1.3 to 0.82] 5 trials 10 outcomes		$ES_{0.5}$ = −0.27 [−1.4 to 0.76] 5 trials 18 outcomes	Insufficient data	Function	All
		Strength of evidence: very low		Strength of evidence: low			

Table includes all comparisons where there were sufficient data.

the dominant class generate substantial heterogeneity over the large data set. When comparing the complete class structure across therapies, it was identified that exercise was most frequently combined with electro-therapy and kinetics. Treatments comprising more than two classes were relatively rare, with the most common including exercise combined with electro-therapy and manual-therapy (21 instances), and a smaller number including four classes (e.g. 7 TAs comprising exercise, electro-therapy, kinetics and MT). Further direct pairwise comparisons in relation to exercise-only interventions suggested that electro-therapy, injection and kinetic (interventions such as taping, brace and orthotics) treatment adjuncts produced similar improvements when combined with exercise. Other systematic reviews have reported similar findings of combined treatments for tendinopathy, although most have conducted standard meta-analysis approaches where appropriate.[27] A recent umbrella review by Irby *et al.* (2020) evaluated 25 systematic reviews of high quality similarly concluded that exercise therapy is the best treatment option for tendinopathy when combined with the use of other therapeutic modalities.[63] We acknowledge that the findings of these direct pairwise comparisons are limited by some uncertainty as indicated by their wide CrIs. Nevertheless, existing reviews reported small to moderate effect sizes for the combined intervention group compared to monotherapy, which is consistent with our study findings.

Summary and limitations of efficacy review 3

As the evidence currently stands, it is still unclear which treatment is the most efficacious for tendinopathy management. The prescription of exercise therapy to modulate the self-reported symptoms of patients with tendinopathy seems to be a practical and efficacious management approach. Part of the reason for this uncertainty stems from the fact that the pathophysiology of tendinopathy and the working mechanisms of existing treatments are not as yet completely understood.[143,144] Some evidence suggests a failed healing response due to degeneration caused by repetitive overloading where demand exceeds capacity to be the main features, while others suggest an inflammatory process.[137,143,144] However, the absence of strong biomarkers of disease progression and recovery at macro- or micro-structural levels means little is known about the physiological effects of treatments, meaning mechanistic studies are inconclusive. An important limitation of efficacy review 3, especially given the findings of greater efficacy when combining multiple exercise and non-exercise therapies, is the reliance on predominantly short-term data. As many patients experience chronic and recurrent tendinopathy, the additional costs of combining multiple therapies must be considered, and at present there is insufficient information to determine whether use of multiple therapies will be superior over the long term. Finally, it is important to note that even at the most granular level of therapy classification used, amalgamation was required to obtain sufficient data to conduct comparisons. This included combining, for example, different electro-therapies or different types of injection therapies. In each case, the strength of evidence for the individual therapy types within a classification is likely to be different. It is therefore recommended that clinicians adopting the findings from this review and, combining a non-exercise treatment such as electro-therapy or injection therapy with exercise, select the specific adjunct with the strongest evidence base.

Chapter 6 Phase II: Contingent synthesis 2: feasibility and acceptability of exercise for tendinopathy, a mixed-method systematic review

Summary

This part of the evidence synthesis investigated the feasibility and acceptability of exercise for the management of tendinopathy via a convergent segregated mixed-method review using JBI methodology.[145] The review questions were:

1. What is the current knowledge of feasibility of delivering exercise interventions for tendinopathy from the perspective of those delivering and receiving interventions?

    a. How feasible is the delivery of exercise therapy in terms of proportions (e.g. of adherence, attendance and fidelity)
    b. What are patients' and healthcare professionals' perceptions of the feasibility of exercise for tendinopathy?

2. What is the current knowledge of acceptability of receiving exercise for tendinopathy?

    a. How acceptable is exercise in terms of, for example, tolerability of and willingness to perform exercise therapy?
    b. What are patients' and healthcare professionals' perceptions of the acceptability of exercise therapy for tendinopathy?

Eligibility criteria included **Participants** (aged 18+, any tendinopathy, any severity; see *Chapter 3*), **Phenomena of interest** (feasibility or acceptability of exercise for tendinopathy) and **Context** (any setting in any country ranked 'very high' on the HDI:[54] top 62 at the time of conducting the review). A comprehensive search identified 13,070 reports. Following screening, 96 reports from 94 studies (85 quantitative; 11 qualitative) were included, representing 4221 participants from 20 countries. The review identified that exercise therapy for a range of tendinopathies is in general feasible to deliver and acceptable to receive. There is considerable heterogeneity in measurement and reporting of feasibility and acceptability, and an urgent need for clearly agreed definitions. A number of important factors are highlighted that impact on both feasibility and acceptability, and these would benefit from further research, particularly qualitative research to further understand these complex phenomena.

Methods

The review followed JBI guidance for mixed-methods systematic reviews,[145] was conducted according to an a priori protocol registered on PROSPERO (CRD42020164641) and is reported according to the PRISMA (2020) statement.[38] We had originally planned a convergent integrated mixed-method review, where quantitative and qualitative data would address the same review questions (quantitative data would be transformed ['qualitised'], combined with the qualitative data and then all the data would be aggregated to generate synthesised findings). Following the scoping review, however, it became clear that quantitative and qualitative studies addressed different aspects of feasibility and acceptability, meaning that combining data was not appropriate. We updated the PROSPERO record (19 November 2021) to reflect a refinement of the review questions, adding sub-questions 'a' and 'b' to each review question (1 and 2), with 'a' being addressed by quantitative data and 'b' being addressed by qualitative data. Separate quantitative and qualitative syntheses were therefore conducted, following which the findings of each single method synthesis were juxtaposed and examined to determine areas of convergence/divergence and where findings from one method may explain findings from the other method.

Search strategy

The comprehensive search strategy for this evidence synthesis comprised: (i) original search conducted for scoping synthesis (*Chapter 4*), with potentially relevant studies identified during title/abstract and full-text screening; (ii) search update conducted for effectiveness synthesis described in *Chapter 5* with potentially relevant studies identified at title/abstract and full-text screening, and (iii) an additional search incorporating keywords specific to feasibility and acceptability, to identify studies that may have been missed by the previous two searches. This additional search was developed with a specialist research librarian (CM) and followed a three-step process: (1) initial limited search of MEDLINE and CINAHL followed by analysis of text words contained in the title and abstract and index terms to construct a full search strategy for each database; (2) applying the full search strategy to each included database, and (3) hand-searching reference lists of included studies for additional publications. The databases searched were MEDLINE, CINAHL, AMED, SPORTDiscus (all EBSCOhost), EmBase (Ovid) and PEDRo. Databases were searched from 1 January 1998, with the last search conducted on 29 March 2021. The full search strategy for each database is available in *Appendix 1*.

Screening for inclusion

As with syntheses 1 and 2, ProQuest RefWorks® was used to manage duplicates, with screening taking place in Covidence (Melbourne, Australia). Two reviewers independently conducted title/abstract and full-text screening against inclusion and exclusion criteria for the review. Conflicts were resolved by discussion or by a third reviewer where necessary. There were few 'true' conflicts, which mainly concerned disagreement on the reason for exclusion, as several studies could be excluded on more than one criterion. Full-text studies that did not meet the inclusion criteria were excluded, and reasons for exclusion are provided as supplementary material on the project website (*Supplementary Material 7*).

Inclusion criteria

Specific inclusion criteria for the mixed methods synthesis were:

Participants

As reported for syntheses 1 and 2, we included adults (18+) with tendinopathy of any severity, duration and anatomical location. Large, full-thickness or massive tears were excluded, as were studies where tear size could not be determined. Plantar heel pain was also excluded.

Phenomena of interest

The qualitative component of this review considered studies that investigated feasibility of delivering and acceptability of participating in exercise therapy for tendinopathy. Feasibility refers to whether the exercise intervention 'can' be delivered and therefore included, but was not limited to, healthcare professionals' views and perceptions of delivering exercise therapy for tendinopathy. Acceptability refers to the acceptability to patients/carers of receiving exercise therapy for tendinopathy. As such descriptions of the phenomena included, but were not limited to, information such as perceptions, experiences, enjoyment, barriers and facilitators to exercise therapies.

Outcomes

The quantitative component of this review considered studies that included any measure of feasibility or acceptability. Feasibility measures included, but were not limited to, attendance, intervention fidelity and adherence. Due to the variability in reporting of feasibility measures, in order to facilitate synthesis we required numerical data to be presented for them to be included in this portion of the review. The review did not include trial-related feasibility outcomes such as recruitment and retention rates, or completion and return of outcome measures, as the focus of the review was on the feasibility of delivering exercise and not the feasibility of trial processes. Acceptability measures included, but were not limited to, measures of tolerability, willingness and satisfaction (with exercise). The review did not include acceptability of trial-related processes such as randomisation and outcome measurement, for the reasons stated above. Therefore, we did not include all studies that reported drop-outs; drop-outs were only included as a measure of tolerability where they could be directly related to the exercise intervention. The review also did not include satisfaction with treatment outcome or satisfaction per se; this was reported in *Chapter 5*, effectiveness. Satisfaction was only included as an outcome in this mixed-method review if it was clear that participants were rating satisfaction with the exercise intervention.

Context

As reported for syntheses 1 and 2, the context was any setting in any country ranked 'very high' on the HDI[54] (top 62 ranked countries at the time of conducting the review).

Types of studies

This review considered quantitative, qualitative and mixed-methods studies. Quantitative studies included both experimental and quasi-experimental study designs, including RCTs, non-RCTs, before and after studies, and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case–control studies and analytical cross-sectional studies were considered for inclusion. This review also considered descriptive observational study designs, including case series, individual case reports and descriptive cross-sectional studies for inclusion. Qualitative studies of any philosophical or methodological underpinning were considered for inclusion if they addressed any aspect of the phenomena of interest. Mixed-method studies were considered if data from the quantitative or qualitative components could be clearly extracted.

Methodological quality assessment

Following piloting, eligible studies were critically appraised by two independent reviewers (two out of AP, JS, KC, RM) for methodological quality using relevant JBI checklists for RCTs, quasi-experimental studies, case–control studies, case-series, case reports and qualitative research.[146] Each checklist consisted of 8–10 questions that could receive an answer of Yes, No or Unclear. For 'Yes', there had to be clear information in the record to answer the question, for 'No' there had to be no mention of this item in the record. Where there was some, but not full, information, an 'Unclear' answer was given. Any disagreements that arose between reviewers were resolved through discussion, or with a third reviewer (LA; 10% of reports required one or more items to be moderated). Due to the size of the review, we did not contact authors for missing data. However, we did not exclude any studies based on methodological quality.

Data extraction

For quantitative studies, following piloting, data were extracted from included studies using a data-extraction tool developed in Microsoft Excel for this review (report *Supplementary Material 8*, *9*). Data included specific details about the populations, interventions, methods and outcomes of significance to the review questions. Two rounds of quantitative data-extraction piloting were conducted to ensure reliability; thereafter data were extracted by one reviewer (one of EP, RM).

For qualitative studies (and qualitative components of mixed-methods studies), data were extracted by two independent reviewers (KC, RM) using the qualitative data-extraction tool in JBI SUMARI software. Data extracted included specific details about the population, context, culture, geographical location, study methods and the phenomenon of interest relevant to the review question. Findings with their corresponding illustrations were also extracted and assigned a level of credibility (unequivocal, credible or not supported). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer (LA).

Data synthesis and integration

A convergent segregated approach to synthesis and integration of data was applied, involving an initial independent synthesis of the quantitative and qualitative studies followed by the integration of findings from each synthesis using a comparative analysis approach.[145]

Where possible, quantitative data were expressed as mean proportions to describe the relative number of patients that found the intervention feasible or acceptable. For example, with feasibility measures such as attendance and adherence, authors' reporting of the total number of sessions prescribed and the mean number of sessions attended/adhered was turned into a ratio (mean/total prescribed). Proportion of 'good' adherence was calculated where authors provided data on the number of patients who completed a high percentage of the prescribed exercise sessions. Authors' selection of a high percentage was taken to be an implicit statement of good adherence. Any threshold above 70% was selected as a relevant measure of good adherence and the specific percentage set by the author recorded. Similar calculations of proportions were made for fidelity and the acceptability measures of tolerability, willingness, satisfaction and helpfulness. Where sufficient data were available for meta-analysis, the logit transformation was performed on proportions and sampling variance calculated using standard distributional assumptions.[100]

After pooling data and obtaining uncertainty estimates, values were back-transformed and expressed as estimated mean proportions.[100] All meta-analysis models were conducted within a Bayesian framework using hierarchical models where multiple outcomes were obtained from the same study. Posterior estimates of the mean proportion were described by the median value and 95% CrIs ($ES_{0.5}$ [95% CrI]). Data that could not be included in statistical analyses are reported narratively.

Qualitative synthesis was conducted using the meta-aggregative approach.[147] Meta-aggregation is aligned with the philosophy of pragmatism, focussing on the practicality and usability of the synthesised findings and generation of statements that are useful for informing actions in clinical practice. This involved assembling and aggregating the extracted findings from individual studies, based on similarity in meaning, to generate a set of statements (i.e. categories) that represented that aggregation. These categories were then subjected to meta-synthesis to produce a set of synthesised findings. The development of categories and synthesised findings was initially conducted via a consensus process between two reviewers (KC, RM), followed by review and discussion with two further reviewers (LA, DM), until consensus on the final synthesis was reached.

The results of each single-method synthesis were juxtaposed and examined for convergence/divergence and complementarity. The findings of each single-method synthesis were reviewed to determine whether they were supportive or contradictory, where one method's findings could explain the other, and to identify which aspects of the quantitative evidence were not explored in the qualitative evidence and vice versa.

Results

Study inclusion

The additional search for this review identified a total of 3824 records (see *Figure 20*). After removing 1320 duplicates, 2504 reports were screened at title/abstract stage. This resulted in 2359 reports being excluded and 145 sought for retrieval. We were unable to locate four reports, therefore 141 were screened at full-text stage, in addition to 163 reports that had been identified from the scoping (see *Chapter 4*) and effectiveness (see *Chapter 5*) searches. Of these 304 reports that were screened at full-text stage, 208 were excluded. There were therefore 96 reports included in the review, representing 94 unique studies. Of these, 85 reports were included in the quantitative synthesis and 11 in the qualitative synthesis. Studies were conducted in Australia (*n* = 17), UK (*n* = 15), the Netherlands (*n* = 9), Denmark (*n* = 8), Canada (*n* = 7), USA (*n* = 7), Germany (*n* = 6), Sweden (*n* = 5), Norway (*n* = 4), New Zealand (*n* = 3), Ireland (*n* = 2), South Korea (*n* = 2), Spain (*n* = 2), Turkey (*n* = 2), Finland (*n* = 1), Iceland (*n* = 1), Italy (*n* = 1)

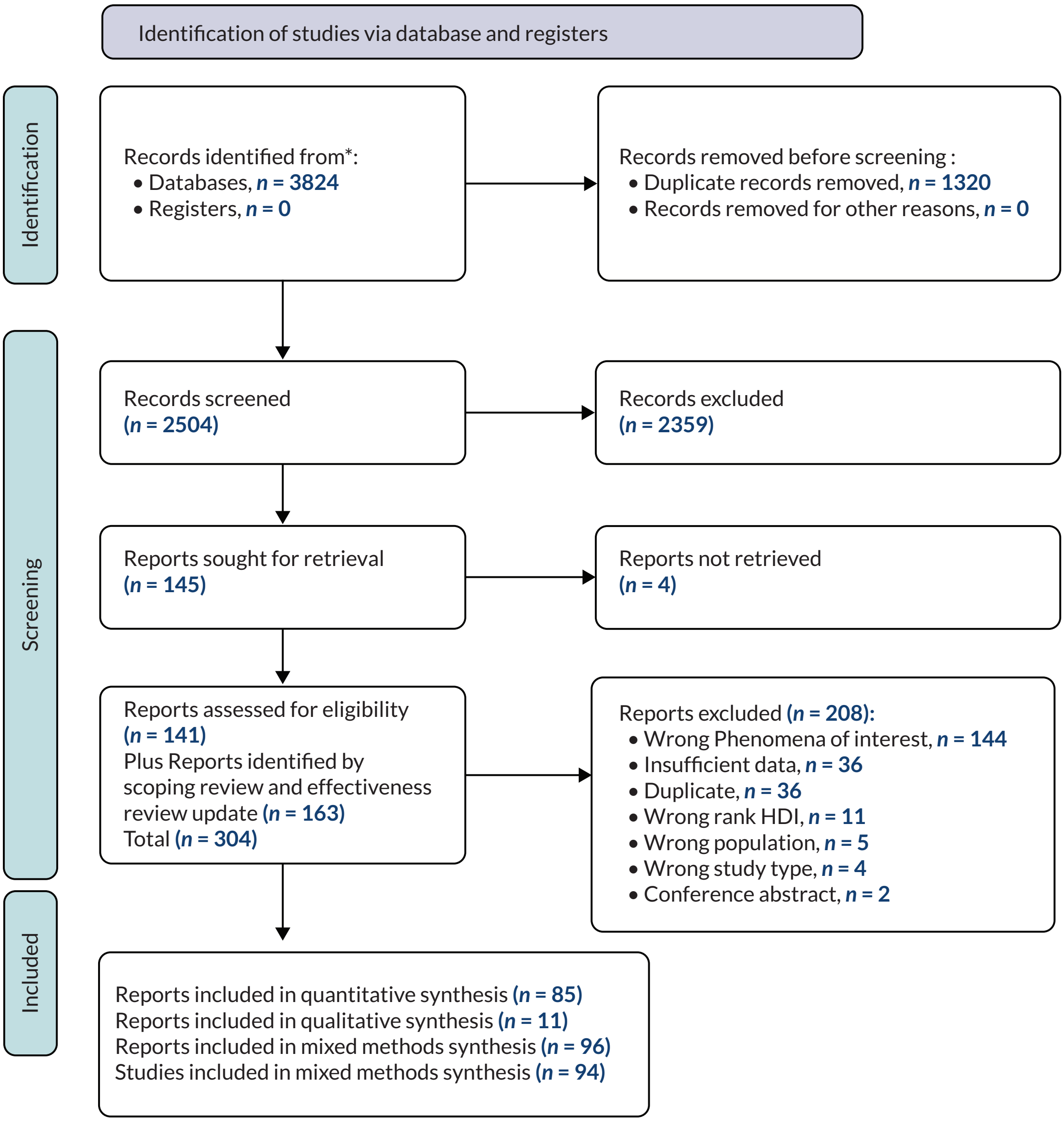

FIGURE 20 PRISMA flow diagram. *From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;**372**:n71. https://doi.org/10.1136/bmj.n71.

and Switzerland (*n* = 1), with two studies being conducted in both the USA and South Africa and one being conducted in Ireland and Northern Ireland. Study characteristics can be found in *Appendix 7* (see *Table 66*).

Characteristics of included studies

Of the 85 quantitative studies, 61 were RCTs evaluating the effectiveness of exercise (with or without co-interventions) compared to another intervention (exercise or another type), and a further seven were pilot and/or feasibility RCTs. Ten studies were quasi-experimental, mostly pre–post designs, two were case–control studies, four were case series reporting on between 5 and 25 patients, and one presented three individual case reports in one paper.[148] Sample sizes ranged from 3[148] to 190,[149] with a total of 4093 included in the review (see *Appendix 7*, *Table 66* for details of included studies).

The qualitative studies included two interpretive phenomenological analysis (IPA) studies[150,151] and two interpretive descriptive studies,[152,153] with the remainder being qualitative descriptive in design (either described as such by the authors or determined by the reviewers from information provided in articles),[1,2,154–159] with two of these embedded in a pilot and full RCT respectively.[107,156]Studies included

5 to 23 participants, with a total of 128 in the review, and mainly utilised semi-structured interviews (face-to-face or telephone), with one study using focus-group methodology.[155]

Participants in seven studies were patients who had recently undergone physiotherapy- (n = 6)[150,152–154,156,157] or podiatry- (n = 1)[151] led interventions for Achilles (n = 2),[152,153] RC (n = 3),[154,156,157] mixed tendinopathy (n = 1)[149,150] or posterior tibial tendon dysfunction (PTTD) (n = 1).[151] One further study recruited patients with greater trochanteric pain syndrome (GTPS) from a physiotherapy waiting list.[158] Three studies[107,154,159] focussed on healthcare professionals' perceptions and experiences of tendinopathy management, whilst two of the included studies recruited both patients and healthcare professionals.[152,156] Of the 128 participants in the review, 78 were patients and 50 were healthcare professionals, mostly physiotherapists, with one study also including sports medicine physicians and surgeons.[159]

The studies (quantitative and qualitative) were focussed on RCRSP (n = 33), Achilles (n = 32), patellar (n = 15), lateral elbow (n = 7), gluteal (n = 4), PTTD (n = 1), hamstring (n = 1) and iliopsoas syndrome (n = 1), with two studies including mixed tendinopathies. A range of exercise types and durations were included (see *Appendix 7*, *Table 66*).

Quantitative studies predominantly reported feasibility measures in the form of adherence or attendance, with a small number reporting exercise fidelity. Less than half of the quantitative studies reported acceptability in the form of tolerability, satisfaction (with exercise), willingness to complete, perceived helpfulness and acceptability (of exercise), all being reported in small numbers of studies.

Qualitative studies explored patients' and/or healthcare professionals' perceptions and experiences of exercise for tendinopathy. Two studies focussed on adherence,[151,157] two on barriers and facilitators to a specific exercise programme being used in an RCT,[107,156] three on the lived experience of having a tendinopathy, which included participants discussing exercise,[151,153,160] one on the experience of participating in an exercise group,[154] one on the experience of gym-based exercise supervised by telehealth[152] and two on healthcare professionals' views of exercise for shoulder tendinopathies.[155,159]

Methodological quality

Details of critical appraisal for each study are presented in *Appendix 8* (see *Tables 67–72*). Quantitative studies were moderate to high quality. For the 68 RCTs (see *Table 67*), methodological quality scores ranged from 5[161] to 13 out of 13,[59,130,162–164] with most studies (72%) scoring 10 or more. Therefore, most studies could be considered high quality, with 19 moderate quality (5–10 out of 13) and none of low quality (fewer than 5 out of 13). None of the studies scored 'No' for question 1: 'was true randomisation used for assignment of participants to treatment groups?' Common questions that scored 'No' were questions 4: 'were participants blind to treatment assignment?', and 5: 'were those delivering treatment blind to treatment assignment?' Questions that were commonly either 'No' or 'Unclear' were question 6: 'were outcomes assessors blind to treatment assignment?', 8: 'was follow up complete and if not, were differences between groups on terms of their follow up adequately described and analysed?', and 9: 'were participants analysed in the groups to which they were randomised?'

The ten quasi-experimental studies were scored out of 9, or where there were was only one participant group, they were scored out of 6 as three questions were not relevant to single-cohort studies (see *Table 68*). All studies scored eight or nine out of nine, or five or six out of six and could therefore be considered high-quality quasi-experimental studies; the most common reason for lower scores (n = 8) was lack of a control group.

The two case–control studies were high quality, scoring 7[165] and 8[166] out of 8 respectively, with two questions not applicable to these studies (see *Table 69*). Of the four case series (see *Table 70*), one was moderate quality (6/10),[167] with unclear reporting of participant demographics and study sites, and the other three were high quality (8/10).[168–170] For all four case series it was unclear whether they utilised consecutive and complete inclusion of participants. The one case report (see *Table 71*) scored 7/8 due to not describing adverse events.

The 11 qualitative studies ranged in scores from 3[154,159] to 10,[150,151,157]with six scoring above and five scoring below six out of ten (see *Table 72*). However, the qualitative descriptive study designs (either stand-alone or embedded within RCTs) were the lowest scores, with the more interpretive methodologies (IPA, interpretive description) consistently scoring high. This is not surprising as five questions on the JBI critical appraisal tool relate to congruency between philosophical perspective, methodology and methods, which are often not reported in detail for qualitative descriptive studies. Two further questions had variable reporting for the descriptive studies. There related to a statement locating the researcher culturally or theoretically (question 6) and the influence of the researcher on the research and vice versa being considered (question 7). These dimensions are also arguably not commonly reported in applied qualitative descriptive or mixed-method embedded designs. Therefore, in relation to the design of the included studies, we considered them to be of moderate to high quality.

Measures of feasibility and acceptability: quantitative findings

I: Feasibility

Four feasibility outcomes were reported across 77 of the included studies. Of these, it was possible to include 63 studies in the meta-analyses. For each of the four feasibility outcomes, defined in *Box 2*, meta-analysis results are presented first, followed by a narrative summary of the remaining studies.

BOX 2 Definitions of feasibility outcomes

Adherence = Mean proportion of training sessions completed by participants

Good adherence = Mean proportion of training sessions completed beyond a 'high' percentage threshold set by authors

Required to be at least 70% to increase consistency

Attendance = Mean proportion of supervised exercise sessions attended

Fidelity = Assessment by study authors of extent to which exercise intervention conducted as intended

Measurement of adherence

Seventy-five studies reported adherence outcomes. Adherence was measured by self-report using exercise diaries/logs (n = 54 studies), telephone calls (n = 1 studies), questionnaires (n = 4 studies) or by questioning participants when they attended for clinical visits (n = 7 studies). Nine studies did not report how they recorded adherence.

Adherence

There were 52 studies that provided data on adherence of training sessions (see *Figure 21*, top). The estimated mean proportion of adherence was $ES_{0.5}$ = 0.76 [95% CrI 0.71 to 0.80] (see *Figure 21*, top).

Good adherence

There were 12 studies that provided data on good adherence of training sessions (see *Figure 21* bottom). There is no single definition of 'good' exercise adherence,[171] with included studies using a range of thresholds. In order to extract data that could be synthesised, we required thresholds reported in studies to be 70% or more. Of the 12 studies included in the analysis, two reported the mean proportion of adherence above 70% of sessions, six studies above 75% and four studies above 80%. Combining these data, the estimated mean proportion of good adherence was $ES_{0.5}$ = 0.79 [95% CrI 0.68 to 0.87] (see *Figure 21* bottom).

Adherence data from the 11 studies that could not be included in the meta-analysis are presented in *Table 28*. It can be seen that most of these studies also reported good adherence, if 'compliant'[172] and

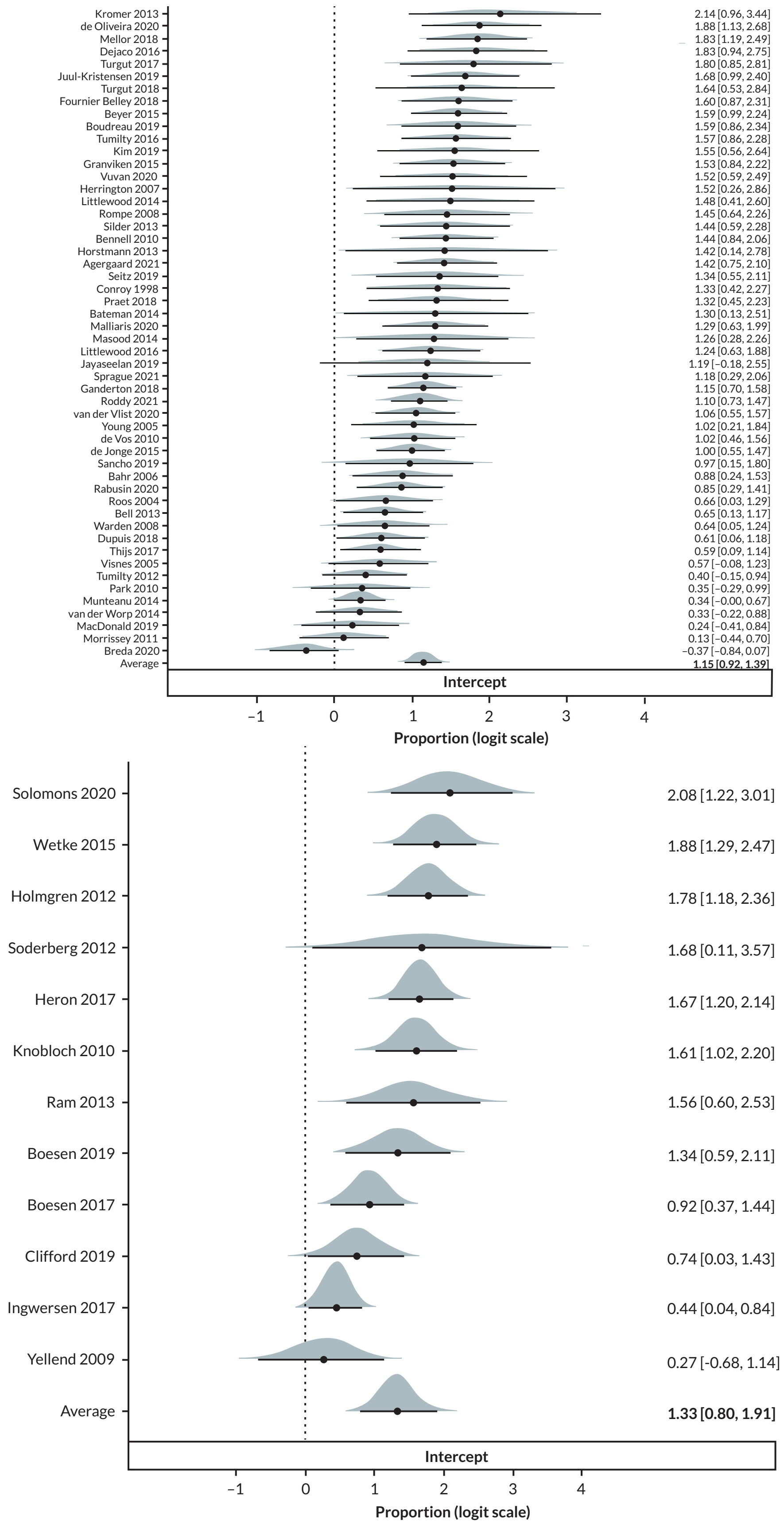

FIGURE 21 Bayesian forest plots for proportion of adherence (top) and proportion of good adherence (bottom). Distributions represent 'shrunken estimates' based on all effect sizes obtained from the study, the random-effects model fitted and borrowing of information across studies to reduce uncertainty. Black circles and connected intervals represent the median value and 95% CrIs for the shrunken estimates. Vertical line at 0 represents proportion of 0.5 on the standard scale.

TABLE 28 Studies reporting adherence outcomes not included in synthesis

Study First author Year Tendinopathy (participants) Intervention	Outcomes reported	Findings			
van Ark 2013[170] Patellar (*n* = 5) PRP injection + graded exercise of 8+ weeks duration	Self-reported compliance rated 0–10 Assessed by asking 'to what extent did you comply with the exercise programme?'	Mean compliance 7/10 Non-compliance was due to lack of time, lack of motivation, holidays, other injuries			
Cook 2014[172] (*n* = 68) RCRSP General exercise programme of varied duration	Compliance with HEP captured at discharge Likert scale (1 highly compliant; 2 compliant, 3 not compliant, 4 extremely not compliant)		Overall	Shoulder/neck	Shoulder
		Highly	52%	49%	55%
		Compliant	41%	43%	39%
		Not	3%	0%	6%
		Extremely not	4%	8%	0%
Coombes 2013[176] Lateral elbow (*n* = 81) 7-week 2 × day HEP (gripping/concentric/eccentric) + 8-weeks physiotherapy +/− corticosteroid injection	Compliance Exercise diary	Mean compliance 70% during at least 5 of 7 weeks			
Dale 2015[173] Lateral elbow (*n* = 17) Pilates-based intervention	Adherence Exercise diary Reported as always, mostly, sometimes and rarely	Most participants completed HEP 5–6 × week			
			Standard	Standard + Pilates	
		Always	11%	38%	
		Mostly	73%	50%	
		Sometimes	11%	0	
		Rarely	0	12%	
Ferrer 2018[177] RCRSP (*n* = 5) 6-week supervised and 6-week HEP, strengthening and ROM	Adherence Daily exercise log	1/5 patients showed poor compliance			
Johnston 1999[168] Iliopsoas syndrome (*n* = 9) Hip rotation rehabilitation programme	Adherence Telephone interview using 3-point scale 1 = very compliant; 2 = moderately compliant; 3 = non-compliant	Mean compliance = 2 (*n* = 9 patients) Moderately compliant Exercises performed consistently but not daily			

continued

TABLE 28 Studies reporting adherence outcomes not included in synthesis (*continued*)

Study First author Year Tendinopathy (participants) Intervention	Outcomes reported	Findings		
Luginbuhl 2008[174] Lateral elbow (*n* = 19) Strengthening HEP (2 × day for 3-months)	Compliance Participants asked at each follow-up	Strengthening 67% compliant 3 months 11% 3 × week only 11% 2 months only 11% stopped after 3 weeks due to pain		Strengthening + forearm band 90% compliant 10% stopped one of the exercises
Rio 2017[167] Patellar (*n* = 25) Double-leg squat using rigid belt 4-week period	Adherence Self-report	23/25 reported adherence data Completed exercises median 5 × week		
Stevens 2014[175] Achilles (*n* = 28) 6-week heel-drop protocols (Alfredson or 'as tolerated')	Adherence Method not reported	Standard (180 reps) 92% target reps		Do-as-tolerated 62% target reps, with similar clinical outcomes
Verrall 2011[149] Achilles (*n* = 190) 6-week progressive eccentric heel-drop programme	Self-reported compliance Participants asked if they completed the exercise programme	86% completed programme 8% ceased due to programme failure 6% ceased as they perceived it had been successful		
de Vos 2007[59] Achilles (*n* = 63) 12-week heavy loaded eccentric training	Daily diary Rated as poor (<25% exercises performed), moderate (25%–50% exercises performed, good (50%–75%), excellent (>75%)	Excellent/good Moderate/poor	Eccentric training 72% 28%	Eccentric training + splint 74% 26%

'mostly'[173] are considered good adherence levels. Two studies reported values below the 70% threshold. Luginbuhl *et al.* (2008)[174] reported 67% compliance with a HEP in their lateral epicondylitis strengthening exercise group (without forearm band) compared to 90% with the forearm band, and Stevens *et al.* (2014)[175] reported 62% adherence in their do-as-tolerated Achilles heel-drop group compared to 92% in the standard group. However, participants were told to aim for around 180 repetitions but could alter the number 'as tolerated', and notably there were no differences in outcome between the two groups. In Johnston *et al.*'s[168] iliopsoas rehabilitation program, although a scale was used, it is not possible to determine the threshold used, only that patients did not complete exercises every day.

Therefore, the studies included in this review provide evidence to suggest that self-reported adherence to exercise is good across tendinopathy and exercise types.

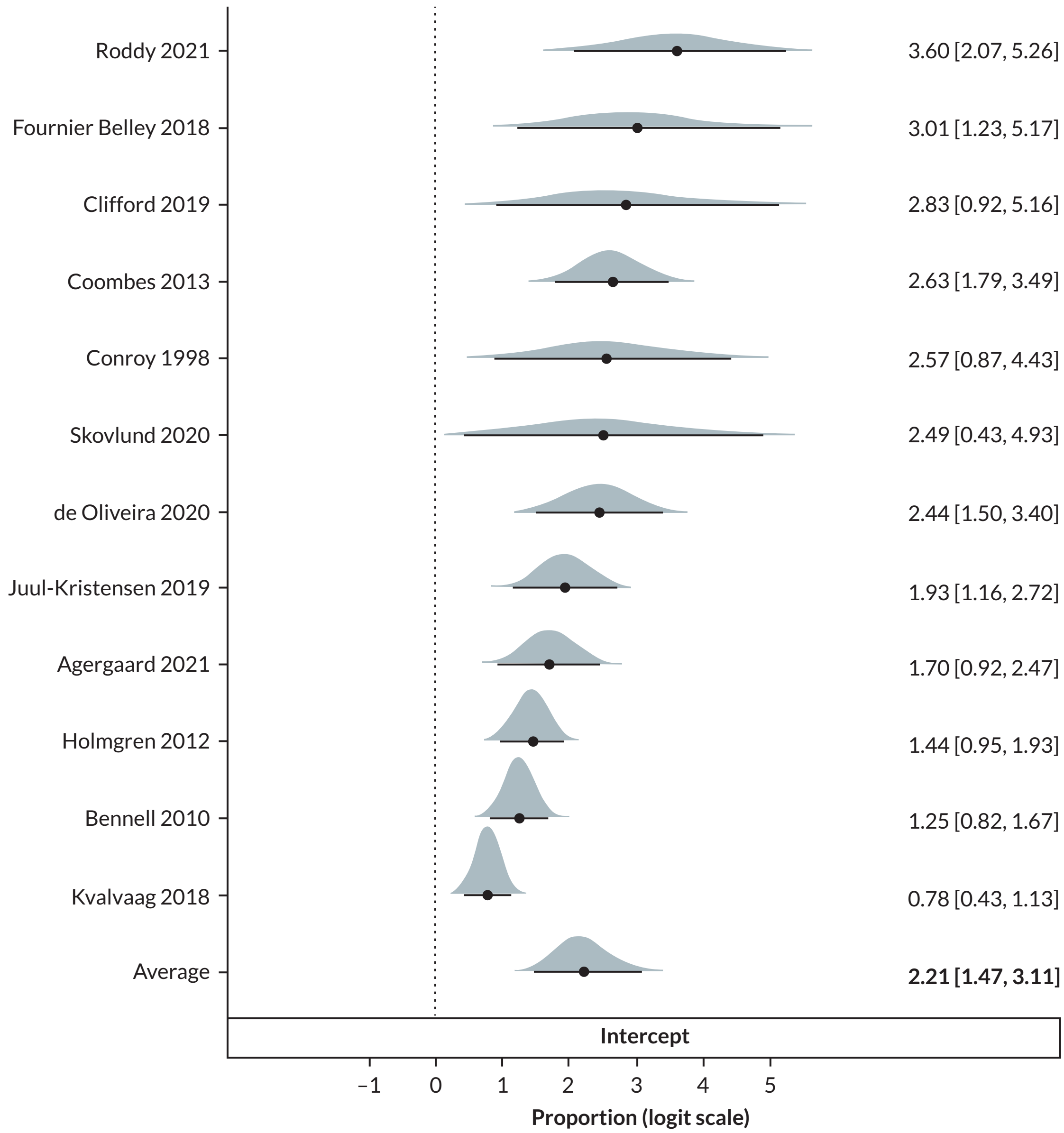

FIGURE 22 Bayesian forest plot for proportion of attendance.
Distributions represent 'shrunken estimates' based on all effect sizes obtained from the study, the random effects model fitted and borrowing of information across studies to reduce uncertainty. Black circles and connected intervals represent the median value and 95% CrIs for the shrunken estimates. Vertical line at 0 represents proportion of 0.5 on the standard scale.

Attendance

Thirteen studies provided data on attendance of supervised exercise sessions (see *Figure 22*). Combining these data, the estimated mean proportion of attendance was $ES_{0.5}$ = 0.90 [95% CrI 0.82 to 0.96] (see *Figure 22*).

Fidelity

Three studies reported fidelity measures. It was not possible to combine these in a meta-analysis; therefore, they are reported narratively. Sancho *et al.*[178] used an exercise diary to assess whether the correct exercises, sets, repetitions, progression and regression criteria had been achieved in their study of pain-guided progressive exercise for AT (n = 15). They used a dichotomous score (achieved or not achieved), with all parameters having to be correct for fidelity to be achieved. They reported fidelity of 50% overall, highest for seated heel-raise (64%) and lowest for double leg jumps (23%). Clifford *et al.*[179]

used a daily diary to evaluate fidelity in their study of progressive home exercise for GTPS (*n* = 30), reporting that all but one of their participants were able to progress loading intensity and use resistance bands as prescribed. Agergaard *et al.*[180] assessed fidelity in their study on moderate slow resistance or heavy slow resistance exercise for patellar tendinopathy (*n* = 42) using an app (InjuryMap), allowing them to evaluate whether the training volume was correctly applied by participants. They reported that the two exercises used in the study (leg press and knee extension) were completed with more than 90% of the prescribed load.

It is not possible to draw conclusions on fidelity of exercise for tendinopathy due to the small number of studies and heterogeneity of measures used.

In conclusion, there is evidence that self-reported adherence and attendance to supervised exercise is good, and that fidelity is seldom reported in studies on exercise for tendinopathy.

II: Acceptability

Twenty-one acceptability outcomes were reported across 17 of the included studies. Due to clinical heterogeneity and limited reporting these findings are reported narratively. Tolerability was most commonly reported (*n* = 15), with satisfaction (with exercise)[109,181] and willingness (to undertake exercise)[181,182] reported by two studies and helpfulness (of the exercise) reported in one study.[168] One study reported acceptability as how easy participants found the exercise programme to fit into their daily activities.[184] Details of the outcomes and findings are presented in *Table 29*.

Treatment tolerability

Tolerability was measured using a scale in two studies. Flores *et al.*[183] used 0 (very poor) to 4 (excellent) with scores above 3 from day-15 onwards in their supervised exercise intervention for RCRSP. Mantovani *et al.*[181] used a 0 (not at all tolerable) to 10 (very tolerable) scale, with mean tolerability to a 12-week daily painful eccentric HEP of 6.3 (±2.2).

Drop-outs

As a result of not tolerating exercise interventions were reported in six studies (2 Achilles,[182,184] 2 lateral elbow,[174,185] 1 patellar,[186]1 RCRSP[161]) investigating a range of different exercise types. Drop-outs ranged from none (RCRSP; 12-week HEP)[161] to 33% (3 participants; 12-week painful quadriceps HEP for patellar tendinopathy),[186]with five of the six studies 11% or less.

Seven studies reported adverse events, most commonly increased pain, as a result of exercise. Pain was evaluated by self-report and defined in various ways (e.g. short-term pain, pain due to exercises, at least one episode of pain over 1-hour duration, muscle soreness, pain intensity during exercise). One study[187]used a numerical rating scale (NRS) to measure pain during exercise (elbow, HEP, mean pain 1.9), one used a structured telephone interview (Iliopsoas, HEP),[168] and the remainder used participant self-report without stating specific methods. The findings (see *Table 29*) show that exercise is generally associated with some increased short-term pain or muscle soreness, but this appears to be tolerable as the proportion of participants reporting pain (range 1% to 60%) is much higher than the proportion dropping out of exercise studies reported above (range 0 to 33%), although it should be noted that there is a large amount of variance between studies for both measures.

Satisfaction

Two studies reported satisfaction with exercise. Mantovani *et al.*[181] found no discomfort or inconveniences reported by participants undertaking a heavy isometric HEP for AT, and Roddy *et al.*[109] reported greater confidence and satisfaction for supervised compared to unsupervised (leaflet) exercise for RCRSP.

TABLE 29 Studies reporting acceptability outcomes

Author/year/tendinopathy/ intervention	Outcomes reported	Findings
Bennell *et al.* 2010[188] RCRSP (*n* = 120) 10-weeks physiotherapy + HEP followed by 12-week HEP	*Treatment tolerability* Reporting of events	*10-weeks physiotherapy + HEP period:* 12/55 (22%) reported increased pain with home exercise *12-week HEP period:* 7/49 (14%) reported short-term pain with home exercise
Flores *et al.* 2017[183] RCRSP (*n* = 84) Supervised exercise with or without hyaluronic acid injection	*Treatment tolerability* 4-point scale 0 = 'very poor' to 4 = 'excellent'	Patients' perception of tolerability: Day 7 = >2.5 (same as injection group) Day 15 = 3.0 (same as injection group) Day 30 = >3.0 (injection group higher) Day 90 = >3.0 (injection group higher)
Ganderton *et al.* 2018[189] GTPS (*n* = 94) 12-week GLoBE or sham exercise programme	*Treatment tolerability* Adverse events	1/94 (1.1%) participants reported increased pain attributed to exercises; completed intervention and follow-up outcomes
Gual *et al.* 2016[190] Patellar (*n* = 53) 24-weeks eccentric overload	*Treatment tolerability* Drop-outs	7/53 (13.2%) dropped out due to injury (2 in the ankle and 5 in the knee joint) directly related to the exercise programme
Ingwersen *et al.* 2017[191] RCRSP (*n* = 100) 12-weeks Progressive high load exercise (PHLE) or low load exercise (LLE) Supervised + HEP	*Treatment tolerability* At least 1 episode of increased pain >1-hour due to exercise	13/49 (27%) PHLE group 18/51 (35%) LLE group
Jonsson and Alfredson 2005[186] Patellar (*n* = 15) 12-week painful eccentric or concen-tric quadriceps training programme	*Treatment tolerability* Drop-outs	3/9 (33%) patients (4 tendons) dropped out of concentric group due to severe tendon pain during and after training
Johnston *et al.* 1999[168] Iliopsoas (*n* = 9) Progressive exercise programme; total duration unclear	*Helpfulness* Structured telephone interview *Treatment tolerability* Structured telephone interview	3/9 (33%) stated exercises with band most beneficial 2/9 (22%) stated stretching and strengthening most effective in combination 2/9 (22%) stated stretches most useful 1/9 (11%) reported the exercises caused pain
Knobloch *et al.* 2007[192] Achilles (*n* = 15) 12-weeks daily painful eccentric HEP	*Acceptability* Telephone call	Participants reported that the daily programme of about 5 minutes was easy to implement into their daily activities (no data reported)
Knobloch *et al.* 2010[182] Achilles (*n* = 75) 12-weeks daily painful eccentric HEP	*Tolerability* Reasons for drop-put	20% non-compliant (*n* = 12) 25% (4/12) reported drop-off due to overwhelming pain
Luginbuhl *et al.* 2008[174] Elbow (*n* = 19) Forearm support or 2.5-month strengthening programme or combination	*Treatment tolerability* Drop-out due to exercise	*Strengthening programme group:* 1/9 (11%) stopped after 3-weeks due to increased pain *Forearm support + strengthening group:* 1/9 (11%) stopped exercise with ball reporting ball to be too hard

continued

TABLE 29 Studies reporting acceptability outcomes (*continued*)

Author/year/tendinopathy/intervention	Outcomes reported	Findings
Mantovani *et al.* 2020[181] Achilles (*n* = 19) Heavy isometric exercise in plantarflexion (supervised)	*Treatment tolerability* 0–10 scale – not at all to very tolerable >5 considered tolerable *Willingness to use intervention* Participants asked if they would adhere to the intervention in a rehabilitation programme – answer Yes/No *Satisfaction with intervention* Self-report	Mean tolerability 6.3 ± 2.2 100% (17 participants) answered Yes No adverse events, discomfort, or inconveniences reported
Peterson *et al.* 2014[185] Elbow (*n* = 120) 12-week graded eccentric or concentric graded HEP	*Treatment tolerability* Drop out related to exercise	1/60 (1.7%) dropped out at 1-month as could not perform intervention
Roos *et al.* 2004[193] Achilles (*n* = 31) 12-week eccentric exercise HEP vs. night splint vs. combination	*Treatment tolerability* Reported side-effects	33% reported muscle soreness with eccentric exercise in first week; no difference between exercise and exercise + splint groups None reported muscle soreness by 6-weeks but 1/16 (6.3%) reported calf stiffness during the day
Walther *et al.* 2004[161] RCRSP (*n* = 40) 12-weeks HEP at least 5 × week for 10–15 minutes	*Treatment tolerability* Drop-outs	No drop-outs from exercise
Roddy *et al.* 2021[109] RCRSP (*n* = 256) 12–16 weeks supervised (physiotherapist-led) or unsupervised (leaflet) exercise with or without corticosteroid injection	*Confidence and satisfaction with intervention* Postal questionnaire *Treatment tolerability* Case report forms, self-report, physician report	Confidence and satisfaction greater in supervised exercise group compared to unsupervised Exacerbation of shoulder pain after performing exercises 59 (60%) supervised and 60 (59%) unsupervised exercise Improved within couple of hours in 22 (37%) supervised and 21 (36%) unsupervised
Stefansson *et al.* 2019[184] Achilles (*n* = 60) 12-weeks pressure massage, eccentric exercise (Alfredson protocol) or combination	*Treatment tolerability* Drop-outs due to exercise	2/19 (11%) dropped out of eccentric group due to exercises aggravating symptoms 1/21 (4.8%) dropped out of pressure massage and 2/20 (10%) dropped out of combination but no reason provided
Vuvan *et al.* 2020[187] Elbow (*n* = 20) 8-week unsupervised progressive isometric exercise program	*Treatment tolerability* Pain intensity during exercise measured on 11-point NRS Length of time for pain to settle after exercise	Mean 1.9 Median 0–60 seconds

GLoBE, Gluteal La Trobe University exercise; LLE, low-load exercise; PHLE, progressive high-load exercise; RCRSP, rotator cuff-related shoulder pain.

Willingness to use the intervention
was reported by Mantovani *et al.*[181] (Achilles, heavy isometric HEP) with 100% (*n* = 17) participants reporting that they were willing to adhere to the intervention.

Helpfulness
of specific exercises for iliopsoas tendinopathy was reported by Johnston *et al.*,[168] with participants reporting various exercises as beneficial.

Acceptability
was briefly reported by Knobloch *et al.* (2007)[192] where they commented that participants reported that the daily 5-minute exercise programme (Achilles, painful eccentric HEP) was easy to implement into daily activities.

Overall, the findings suggest that exercise for tendinopathy is acceptable to participants across a range of tendinopathy and exercise types and formats (supervised, HEP). However, heterogeneity in defining, measuring and reporting the various dimensions of acceptability limit our ability to draw firm conclusions. Furthermore, most of the studies included in the quantitative component of this mixed-method review did not provide acceptability data. Therefore, the findings should be interpreted with some caution.

Patients' and healthcare professionals' experiences and perceptions of exercise for tendinopathy: qualitative findings
Eleven qualitative studies explored 78 patients' and 50 healthcare professionals' experiences and perceptions of exercise for tendinopathy. The mean age of patients ranged from 40[153] to 64.7[107] years (mean for *n* = 7 studies 55.8), with one study not reporting a mean age but including athletes aged 24–38.[150] Both genders were represented, and studies ranged from 10%[160] to 67%[107] males (one study did not report gender).[152] A total of 68 findings and their illustrations were extracted (see *Appendix 9*, *Table 73*). Of the 68 findings, 54 were unequivocal and 14 were credible. The 68 findings were organised into nine categories which were further aggregated into two synthesised findings.

Synthesised finding 1
Patients and healthcare professionals report a range of highly personalised experiences and opinions of exercise therapies along with several barriers and facilitators to adhering to exercise. Therefore, a person-centred, individualised approach should be taken to delivering such interventions to people with tendinopathy.

Seven categories and 51 findings contributed to this synthesised finding (see *Table 30*), which represents the variability in patients' and healthcare professionals' perceptions and experiences of exercise interventions and the way they are delivered. Both patients and healthcare professionals can have conflicting views on the same exercise type and mode of delivery, and healthcare professionals need to be cognisant of this when prescribing therapeutic exercise for individual patients. The majority of findings in this synthesis relate to physiotherapy-delivered exercise interventions and the views of physiotherapists.

However, one finding was drawn from podiatry[151] and one from a study that included sports medicine physicians and surgeons in addition to physiotherapists.[159]

Category 1.1: Perceptions and opinions of exercise interventions from patients' and physiotherapists' perspectives
This category concerned patients' and physiotherapists' opinions of specific exercise interventions they had experienced receiving and delivering, which included group-based exercise for RCRSP, a self-managed loaded exercise programme for RCRSP consisting of a single exercise performed twice per day, and a gym-based and remotely supervised (telehealth) progressive loading programme for AT.

TABLE 30 Qualitative synthesised finding 1

Findings	Categories	Synthesised findings
Support, motivation, and learning from peers (U) Preference for exercise class compared to individual shoulder physiotherapy (U) All participants (8/8) found progressive loading exercises to be an effective form of treatment compared to their experience of previous treatment approaches (U) *The nature of the exercise* Several participants (5/8) appreciated the simplicity (i.e. two calf-raise exercises) and how clearly they were explained as part of the trial intervention (U) *Exercise* Several participants (5/8) expressed a feeling of leg discomfort from the pressure of the Smith bar on their thigh during their seated calf raises (U) The exercise group was cited as being good fun and helpful by several participants (U) Prescription of the self-managed loaded exercise programme was a challenge in terms of what might be regarded as the simplistic and restricted nature of the intervention (C) Most of the physiotherapists appreciated the simplicity, particularly from the perspective of the patient, in terms of improving communication and exercise adherence (U) This simplicity was not appreciated by all and the physiotherapists considered this from their own perspective and that of the patient (U) The physiotherapists felt that most of the patients took longer to achieve a worthwhile clinical outcome than might be expected using other means of treatment (U) Some patients still expressed concern about attributes of the intervention (C) Disquiet was expressed about the simplicity of the intervention and hence its lack of potential effectiveness (U) Whereas some patients had found aspects of the intervention difficult to implement, those patients who reported a successful outcome detailed different experiences (U)	**Category 1.1** Perceptions and opinions of exercise interventions from patients' and physiotherapists' perspectives	*Synthesised finding 1* *Patients and healthcare professionals report a range of highly personalised experiences and opinions of exercise interventions and their modes of delivery, along with several barriers and facilitators to exercise adherence, indicating the need for a person-centred approach to delivering such interventions to people with tendinopathy*

continued

TABLE 30 Qualitative synthesised finding 1 (*continued*)

Findings	Categories	Synthesised findings
All participants (8/8) expressed satisfaction with the quality of service they received via telehealth mainly because it was perceived to be efficient (C)	**Category 1.2** Barriers and facilitators to the delivery of exercise for tendinopathy	
Usability of the software Nearly all participants (7/8) reported that the telehealth software was easy to use (U)		
Flexibility in arranging an appointment time The flexibility and convenience of telehealth allowed participants to schedule treatment/exercise within convenient times that avoided peak gym-use times (U)		
Several participants (4/8) complained about poor or no Wi-Fi at their gym. There were reservations about having to use their personal phone internet data for the videoconference call. On several occasions, participants reported they were running out of phone battery, which impacted the length of the session (U)		
For a few participants (2/8), assistance was needed to set up the correct camera angle of their phone while they were training on the Smith machine. (U)		
Physiotherapists reflected on the accessibility and convenience of telehealth. Further, physiotherapists felt telehealth enabled more regular contact with participants (U)		
Technology-related Physiotherapists noted multiple technology-related issues during the telehealth sessions, including poor videoconference quality or loss of video conference connection, insufficient participant phone battery life and inability to operate the videoconference video function. Some sessions had to be discontinued due to technology-related issues (U)		
A few physiotherapists discussed the limitations of only having one camera angle to view participants and assist with providing feedback related to calf exercise fidelity. In some cases, physiotherapists experimented with camera angles to improve visualisation (U)		
Gym-based exercise Physiotherapists reported some challenges accessing the Smith machine for some of their participants especially when the local gym had limited equipment (e.g. only one Smith machine). In some cases, sessions had to be rescheduled due to long waiting times (U)		

TABLE 30 Qualitative synthesised finding 1 (*continued*)

Findings	Categories	Synthesised findings
Motivation (U) Social support (U) All participants (8/8) reported that telehealth was motivating and promoted commitment to their exercise programme (U) *Accessibility to the gym* Several participants [5/8] accessed a 24-h gym in a convenient location, which reportedly assisted with adherence and motivation (U) *Ability to see progress* All participants (8/8) described that the care provided was effective in terms of improvement in symptoms and function. Being able to observe progress and experience less pain was reportedly a key motivator (U) Physiotherapists proposed that more encouragement and motivation were needed for participants requiring longer time to complete their sessions (i.e. participants in low-intensity groups who completed 18 repetitions per set rather than six). One of the proposed strategies was a follow-up email post-session (U) One patient recognised the role of their partner in providing feedback and stimulating further engagement with the self-managed exercise programme during times when progress was slow (C) Patients also described personal traits that indicated self-efficacious individuals who took control of the programme (U) Other personal attributes were also described (U)	**Category 1.3** Facilitators to engaging with/adhering to exercise interventions	
Confidence (U) Lack of success with physiotherapy was attributed to many reasons, including lack of belief about the effectiveness, lack of compliance with treatment and the pain caused by exercise (U) *Time* Making time to commit to regular exercise was reported as a barrier by several participants (6/8). This was commonly because of competing commitments, e.g. employment or caregiving (U) One patient reflected upon a previous episode of physiotherapy when engagement with a prescribed exercise programme was limited (C)	**Category 1.4** Barriers to engaging with/adhering to exercise interventions	

continued

TABLE 30 Qualitative synthesised finding 1 (*continued*)

Findings	Categories	Synthesised findings
What challenges and enablers should be considered in RT education delivery? 'Maybe we can get better?' (U)		
Beliefs about pain and exercise (C) Most of the participants in this cohort experienced some form of treatment burden/fatigue with respect to the prescribed exercises and orthoses. This had psychological consequences when the orthoses or exercises were not having a positive effect in reducing pain or improving function (U) Pain (U) Most participants remained positive about the potential of exercise therapy to improve their condition and were even happy to tolerate discomfort during it (8/10). This was often caveated with the associated desire to understand when symptoms indicated that exercise was detrimental (U) However, not all participants (2/10) would find some discomfort with exercise acceptable, as pain elicited during exercise lingered significantly in some cases (U) Discussion around this factor generated a broad range of responses from those who were very comfortable with the notion, those who were very uncomfort-able and those who might be regarded as taking more of a middle ground (U)	**Category 1.5** Influence of patients' and healthcare professionals' beliefs about the pain–exercise relationship	
However, in contrast participants also discussed their disbelief and lack of confidence in relation to a proposed exercise intervention (C) Participants also highlighted the expected role of exercise interventions in the management of their AT (C) This illustrates and emphasises the need to find strategies to educate patients regarding expected rehabilitation and recovery times to ensure that their expectations are realistic (U) For others with greater experience, it was apparent that their existing belief system served to facilitate for some, but challenge for most, the rationale underpinning the self-managed loaded exercise programme (U) This narrative from the patient perspec-tive was in concordance with opinion expressed by one of the physiotherapists, where it can be seen that prior beliefs might impact upon their role in this environment (C)	**Category 1.6** Influence of patients' and physio-therapists beliefs about exercise (per se and specific intervention components)	

TABLE 30 Qualitative synthesised finding 1 (*continued*)

Findings	Categories	Synthesised findings
Physiotherapists felt able to identify patients who they expected would successfully engage with the self-managed exercise programme (U)		
A key barrier to ongoing engagement appeared to be a lack of an early and appreciable response to the therapy (U)	**Category 1.7** Impact of symptomatic response to exercise	
When the symptoms improved to a certain point, although not resolved, the impetus to continue was also challenged (C)		
Following some early reported benefit from the exercise programme, one patient indicated subsequent difficulty as the symptoms failed to respond as the programme progressed. Despite this, they did not consider regressing the programme or seeking advice, indicating an external locus of control as a potential barrier (C)		
Patients experienced a favourable therapeutic response that persuaded them of the potential value of the programme to them (U)		

This category was supported by 13 findings. Three unequivocal findings expressed patients' enjoyment of and preference for group-based exercise (RCRSP), which provided opportunities for peer learning and support:

> *You're better off to do it in a group ... you'd be more determined to do it ... you don't put the whole 100% effort in at home. (Ben) (p. 467)*[154]

Six unequivocal and two credible findings discussed contrasting views of the 'simplicity' of self-managed exercise for both Achilles and RCRSP. Some participants and physiotherapists appreciated programmes with few components:

> *It was simple and easy to do and straightforward. (P4) (p. 7)*
>
> *[patient; Achilles]*[152]

> *it's been a lot simpler treating the self-management group; keeping the exercise regime simpler, the patients have understood it more, erm the conversation between therapist and patient has been clearer. (P11) (p. 282)*
>
> *[physiotherapist; RCRSP]*[107]

However, some found even simple exercise programmes could be challenging to implement:

> *at first it seemed like a big task to do, because it was an additional thing to do through the day. (ID 18) (p. 82)*
>
> *[patient; RCRSP]*[156]

Whilst others questioned the potential effectiveness of such a simple programme:

> *to cap it all it's such a simple exercise . I just came out thinking waste of time. (ID 29) (p. 82)*
>
> *[patient; RCRSP]*[156]

For my patients, they certainly found it slightly different, especially those that had experienced private physio before, erm they said oh, is that it? They were, well are you not doing anything else? Is it just one exercise? Is that it? (P8) (p. 282)

[physiotherapist; RCRSP][156]

The remaining two unequivocal findings demonstrated the individualised nature of the exercise experience, with the same Achilles loading intervention eliciting discomfort in some patients, whilst others rated it positively compared to their previous experiences:

It was suggested that I use like a foam mat or something, but I was up to about 100 odd kilos, it was quite painful to have the bar on. (P5) (p. 7)[152]

The idea that it is more about of putting it [Achilles tendon] under load for longer has been a lot more effective than all the stretching, warming and icing and everything else that I have tried before. (P8) (p. 4)[152]

Category 1.2: Barriers and facilitators to the delivery of exercise for tendinopathy

This category comprised eight unequivocal and one credible finding from a single study[152] on patients' and physiotherapists' perceptions of a gym-based self-managed intervention supervised via telehealth for AT. Notably this study had one of the younger samples (mean age 46.1). Efficiency, convenience and accessibility were reported as facilitators:

I did not have to go and wait in an office or whatever. I could just go to the gym and just get started and if he was not ready or whatever then I could just get into my workout and he [physiotherapist] would join me halfway through sometimes. There was no waiting around. (P4) (p. 4)

[Patient][152]

I found that close contact especially with quite anxious type [participants], just being able to reassure them that where their early stages were absolutely fine and appropriate and to be expected, I think that helped them stick to the course. (PT 4) (p. 8)

[Physiotherapist][152]

Barriers were related to technology and equipment, with issues such as internet connectivity, mobile phone battery, difficulty positioning mobile phone cameras for physiotherapists to assess exercise performance, and difficulty accessing particular pieces of gym equipment being reported:

It was the longer regimen that I was on [low-intensity group]. A couple of times my battery went out and I was using up all my data because it was an hour and a half session. (P8) (p. 6)

[Patient][152]

I think most people have that gym etiquette that someone is using [the machine] then leave them alone and then just keep the workout or do something else, but couple of times I have had to cancel a session because patients could not access the Smith machine for like half an hour or 40 minutes. (PT5) (p. 9)

[Physiotherapist][152]

However, most patients reported that the telehealth software itself was easy to use.

Category 1.3: Facilitators to engaging with/adhering to exercise interventions

This category, composed of eight unequivocal and one credible finding, concerned the intrapersonal (e.g. ability to see progress, personality traits, motivation), interpersonal (e.g. social support from others – friends, partners, physiotherapists) and environmental (e.g. aspects of the intervention, exercise setting) factors that can facilitate engagement with/adhering to exercise interventions.

Four unequivocal findings contributed to the role of intrapersonal factors, with motivation seen as a facilitator to exercise, especially if it meant a return to previous activities:

> *Knowing I would be out of action for three to four months was enough motivation to make me want to stick to my rehabilitation program. My motivation was born out of the fact that I was terribly frustrated with not only being unable to compete, but also missing out on the social side. (Max) (p. 218)*
>
> *[Athletic rehabilitation, mixed tendinopathies]*[150]

Indeed, ability to see progress in terms of improvement in symptoms and function was also an important facilitator:

> *I do not have the pain that I used to. I was getting to the stage at times I was quite immobile at work. But I have not had that ever since the programme finished … which is great. (P1) (p. 7)*
>
> *[Achilles]*[152]

As was the internal motivation to be pain-free:

> *I was driven to get rid of this pain really, so I thought I'm going to give this a really good go and do it properly. (ID 18) (p. 83)*
>
> *[RCRSP]*[156]

Personality traits were also considered facilitators, indicating individuals with high levels of self-efficacy were more able to engage with and control their exercise programme:

> *I kept my diary and I always wrote why I'd not done it so that I could think to myself well how can I fit that in then? (ID 18) (p. 83)*
>
> *[RCRSP]*[156]

Two unequivocal and one credible finding contributed to the role of interpersonal factors in facilitating engagement and adherence. Social support can come in the form of family and/or friends and can be a source of reassurance for patients:

> *C: Oh, the support I got from my family and friends was great. My husband has been fantastic watching over me making sure I don't do anything I shouldn't. My best friend sometimes came to the rehab centre with me which I really appreciated. (Carol) (p. 221)*
>
> *[Athletic rehabilitation, mixed tendinopathies]*[150]

> *My (partner) erm kept saying to me that (they) thought that I was complaining a lot less as time went on. I didn't feel that but she assured me that I was. (ID 15) (p. 83)*
>
> *[RCRSP]*[156]

Physiotherapists also play an important role in facilitating engagement. In one study (gym-based, remote monitoring for AT), it was suggested that patients with longer (duration) gym sessions required more motivation and encouragement to complete their sessions and innovative methods of providing that encouragement:

> *I think other people who got irritated around time at the gym they definitely did longer session … I liked the follow up emails after the session, sort of template kind of idea of what you could send them [to*

> participants] *at some point positive things from their session encouraging them for the next week. (PT 3) (p. 8)*
>
> *[physiotherapist; Achilles]*[152]

The final two unequivocal findings contributed to the role of environmental factors in facilitating engagement with exercise interventions. Environmental factors concerned aspects of the intervention itself, such as the use of audio-feedback during a telehealth exercise programme for AT:

> *The audio feedback and them [physiotherapists] telling you to go longer, faster, shorter, harder, whatever their instruction happens to be, that is sort of invaluable. (P3) (p. 5)*[152]

Exercise location can also have an impact, and, for the same telehealth exercise programme, access to a 24-hour gym promoted adherence and motivation:

> *Access to the 24-hour gym was handy for me, because I work in different hours and have got family and young kids, so it's quite good that I could go at any time I wanted … and having the various gyms and having access to those around the place definitely helped me, because like I said, I travel a fair bit for work, so that was very handy. (P7) (p. 7)*[152]

Category 1.4: Barriers to engaging with/adhering to exercise interventions

This category consists of four unequivocal and one credible finding, and concerns intrapersonal barriers such as confidence, motivation, pain and time.

The personal impact that a lack of confidence can have on performing a sports injury rehabilitation programme was described (unequivocal finding):

> *Although all the prescribed exercises were new to me, I felt confident performing them in the rehabilitation centre because I knew I was being monitored by the physio, however, I felt much less confident performing exercises at home by myself …. I wasn't entirely sure I was doing the exercises correctly and, as such, I didn't want to further injure myself, having this concern made it difficult for me to comply with home-based exercises. (Carol) (p. 218)*
>
> *[mixed tendinopathies]*[150]

Barriers can also concern internal motivation, with one RCRSP patient (credible finding) describing limited engagement in a previous episode of physiotherapy:

> *I didn't do them … I don't know – because I thought they were doing it for me. So, I came back with the booklet but I didn't do them. I thought oh well, I'm going back next week. (ID 18) (p. 83)*[156]

Exercise-related pain can be considered a barrier to exercise intervention adherence, with questions posed as to whether the exercises were helping because of the pain (unequivocal finding):

> *I think I had about three different ones (physiotherapists) … and they were also the ones who did the hydrotherapy and acupuncture as well … but the exercises were just putting me in pain, so it didn't help. (P10) (p. 4)*
>
> *[GTPS]*[160]

Most of the patients in Hasani *et al.*'s[152] study on gym-based exercise for AT noted that time to commit to regular exercise can be a barrier for a variety of reasons:

> *It was so time-consuming … I did not have much time to do anything else in the gym. (P5) (p. 7)*[152]

The final unequivocal finding in this category involved a physiotherapist reflecting on the challenges and enablers that need to be considered in tendinopathy management:

> *Work together in a positive pathway with me describing the exercises and illustrating how to do them and motivate patients and have the patients adhere to the program. Because adherence is the key to the success. If they come back and they say, well, I forgot your exercises. I did them once a week instead of every day, then we are not moving forward … so it is a shared responsibility. (P2, Physiotherapist) (p. 3)*[159]

Category 1.5: Influence of patients' and healthcare professionals' beliefs about the pain–exercise relationship

Five unequivocal and one credible finding contributed to this category, with a range of views regarding the pain–exercise relationship represented.

Two findings (one credible, one unequivocal) described a positive perspective on the pain–exercise relationship, whereby pain was a motivator for exercising due to the anticipated response:

> *Still every day I do my exercises and I find that when I feel the pain coming on in my arm, I have a walking stick and I just do exercises with that, I haven't taken pain killers in I don't know how long, I am good with pain now. (Margaret) (p. 468)*
>
> *[RCRSP]*[154]

Whilst patients were positive about the potential for exercise therapy to improve symptoms, and they would tolerate some discomfort, they did want to know how far to 'push':

> *Oh, good Lord yeah. Anything that would help I'd go for …. If they told me that it would help (exercise with discomfort), I would do it. (When asked what information would be useful) Would it be detrimental if I pushed myself that little bit further? (P8) (p. 5)*
>
> *[GTPS]*[160]

In contrast, two unequivocal findings highlighted that some patients find exercise-induced pain intolerable, particularly if it impacts on daily living:

> *I wouldn't do it (put up with discomfort during exercise). And that is purely because if it affects my day to day living … it's just not worth it. (P6) (p. 5)*
>
> *[GTPS]*[160]

In some cases, continued pain was considered a treatment burden with associated psychological consequences:

> *I felt awful, yeah I mean I was doing them (exercises) it was painful, and I was quite regimented, I was like I've got to do the physio because I've got to make it better … it had been going on a really long time it was just getting worse. (Mila) (p. 6)*
>
> *[PTTD]*[151]

The final unequivocal finding concerns physiotherapists' perspectives on the pain–exercise relationship, with physiotherapists expressing varied levels of comfort concerning pushing through pain: for example:

> *in terms of the training it was always saying, taught that you don't want to push in to pain that you don't, you might get associated inhibition and sort of, of the muscles alongside it so, so different from that point of view. But then, like you said, if you have a look at it from the eccentric loading perspective then we do ask people to, to go in to pain when they're exercising so erm I could see how it might fit.. (P7) (p. 282)*
>
> *[RCRSP]*[107]

Category 1.6: Influence of patients' and physiotherapists beliefs about exercise

Three unequivocal and three credible findings contributed to this category, which demonstrates that physiotherapists and patients have a range of beliefs about exercise per se and about different components within exercise interventions, and that these need to be considered when prescribing therapeutic exercise for tendinopathy, as they may have a positive or negative impact.

Three findings (one unequivocal and two credible) provide a patient perspective about beliefs surrounding exercise. Some patients expressed a lack of confidence in relation to the proposed exercise intervention:

> *but I know there are some exercises you should be doing and things like that. I probably haven't done as much strength work. I don't go to the gym. I don't do any strength work or anything like that. (Participant 1) (p. 110)*
>
> *[Achilles]*[153]

Other patients with the same tendinopathy seemed to know that exercise would be involved from their prior experience:

> *There was a therapy that was recommended to me maybe at the start of the year, it was called heel drops or painful heel drops? They're on the edge of the steps and you basically flex, you basically flex down and flex up …. Was it 10 minutes a night every night for 12 weeks but in my head that was crazy. (Participant 5) (p. 111)*[153]

An important factor for healthcare professionals to consider is educating patients to ensure their expectations are realistic:

> *At first I expected to see an improvement within a few weeks but it was so small. They tried to encourage me saying it was a long haul and by the end they said it would be six to nine months. I think it might have helped to know the six-to-nine-month time frame at the beginning. (Participant 62) (p. 196)*
>
> *[RCRSP]*[157]

Three findings (two unequivocal and one credible) provide the physiotherapist perspective, and focus on the impact that their own beliefs can have, such as questioning the rationale underpinning a self-managed loaded exercise programme consisting of one exercise:

> *to give one exercise … it was more I had a bit of an issue with that more than the patient did to start with. (P11) (p. 281)*
>
> *[RCRSP]*[107]

Physiotherapists involved in prescribing exercise for RCRSP also felt confident that they could identify whether patients held helpful or unhelpful beliefs about exercise and therefore predict whether or not they would engage with exercise therapy:

> *I think there are some clients who from interviewing them, doing the examination, that you get an idea of whether they would be compliant and appropriate, and others you just think it's totally inappropriate and a waste of time. (T1) (p. 82)*[156]

Category 1.7: Impact of symptomatic response to exercise

Two unequivocal and two credible findings contributed to this category, which shows that symptomatic response to exercise is an important factor that impacts on adherence. All four findings relate to one qualitative study[155] that included six patients and two physiotherapists involved in a pilot RCT of a self-managed loaded exercise intervention for RCRSP. These findings demonstrate that symptomatic improvement is a key facilitator for continuing with exercise. However, failure to respond, a slow response or a plateau in symptoms could have the opposite effect:

> *I think that when you find that they're not making a great deal of improvement, you're less inclined to erm continue it. (ID 37) (p. 82)*[156]

Synthesised finding 2

Patients and healthcare professionals place value on appropriate and timely patient education facilitated by an effective 'therapeutic alliance' between patient and physiotherapist, to promote motivation and confidence in the exercise intervention.

This synthesised finding was generated from 2 categories and 16 findings (13 unequivocal, 3 credible; *Table 31*) and illustrates the value that patients and healthcare professionals place on self-management and patient education, recognising that it is facilitated by the patient–therapist relationship, which is vital for the motivation and confidence required to adhere to an exercise intervention.

Category 2.1: Importance of the patient–therapist relationship

Nine unequivocal and one credible finding contributed to this category. Patients with a range of tendinopathies highlighted the mostly positive aspects of the patient–healthcare professional relationship. Specifically, physiotherapists are seen as educators and facilitators who enable patients to cope with their tendinopathy and exercise programme, providing confidence and motivation to continue:

> *Performing the rehab exercises can be demanding physically and emotionally .... So to have found a physio who was very supportive was very comforting and reassuring. The physio provided good guidance and frequent feedback about how well I was doing; he seemed to have a lot of time for me in the clinic and had taken a keen interest .... This made me feel valued. He wanted me to get better and this came across well. It is because of this that I didn't want to let him [the physio] down. (Carol) (p. 220)*
>
> *[Patient, athletic rehabilitation, mixed tendinopathies]*[150]

Physiotherapists likewise recognise the importance of the therapeutic alliance and its uniqueness:

> *Some patients might need five minutes of education, another patient may need two or three sessions where it is quite intensive, or they might need to cover different areas, so I think it depends on the patient that you have in front of you similar to what exercise you prescribe. (P1, PT) (p. 3)*
>
> *[Physiotherapist; RCRSP]*[159]

Motivation provided by the physiotherapist can also be provided effectively via telehealth supervision of exercise, with regular contact being valued:

> *I think if you did not have to talk to anybody, you might get lazy some days and not bother. Whereas that sort of kept you committed and making sure you will not forget your exercises. (P6) (p. 7)*
>
> *[Patient, Achilles]*[152]

Physiotherapists agreed with this, but were aware of the potential barriers created by telehealth also:

> *I was probably a little slower to develop the relationship, so I found a couple of sessions to sort of warm up and get a bit more hold over messages. (PT 1) (p. 9)*
>
> *[Physiotherapist; Achilles]*[152]

Despite most findings in this category relating to the positive influence of physiotherapists, they need to be aware that they can also have a negative impact on their patients:

TABLE 31 Qualitative synthesised finding 2

Findings	Categories	Synthesised finding
The physiotherapist as an educator and facilitator (U)	**Category 2.1** Importance of the patient–therapist relationship	*Synthesised finding 2* *Patients and healthcare professionals place value on appropriate and timely patient education facilitated by an effective 'therapeutic alliance' between patient and physiotherapist, to promote motivation and confidence in the exercise intervention*
Coping (U)		
Therapeutic alliance All participants (8/8) acknowledged that despite not being face-to-face with their physiotherapist, they still felt reassured by the telehealth contact with their physiotherapist, especially in the early stages when they were gaining familiarity and confidence with the treatment process (U)		
Regular contact Participants appreciated the ability to have regular contact with a physiotherapist for support and obtain immediate feedback to allow them to progress their exercises (U)		
Therapeutic alliance Although physiotherapists reported that the use of telehealth was an effective method for therapeutic interactions, they also reported some barriers to developing a therapeutic alliance (U)		
The physiotherapists recognised the importance of knowledge translation and the need to 'sell' the self-managed exercise intervention, both of which were underpinned by the need to develop a therapeutic relationship (U)		
Additionally, the patients described the role of the physiotherapist which, in some situations, seemed to compound the negative nature of their prior beliefs (C)		
The influence of the physiotherapist was framed in a more positive way (U)		
Additionally, with regard to the pro-active follow-up by the physiotherapist another patient recognised … (U)		
Patient-centred care promotes development of a therapeutic alliance: 'If a patient trusts you then you are generally going to get much better results' (U)		
Self-management education All participants (8/8) noted that the one-to-one self-management education they received at the start of the rehabilitation programme was helpful and changed the way they perceive their Achilles symptoms. Specifically, the education improved their self-efficacy and ability to understand acceptable pain limits during activity (U)	**Category 2.2** Importance of patient education and self-management	
The importance placed on being able to manage their own condition through improved knowledge and a feeling of increased control was highlighted as a recurrent theme within the participants' transcripts (U)		
Need for patient education (C)		
Achieving patient education (U)		
With reference to the exercise diary which is used as a key component of the programme as a means of self-monitoring, one patient reflected … (C)		
The need for early, focussed education: 'Some beliefs can be detrimental to rehabilitation options' (U)		

> *well, I think (physiotherapist) felt more or less straight away that it was unfortunate that I'd drawn the short straw in terms of that. (ID 37) (p. 82)*
>
> *[Patient, RCRSP, referring to single exercise intervention][156]*

Category 2.2: Importance of patient education and self-management

Four unequivocal and two credible findings were included in this finding, in which patients and healthcare professionals concur on the importance of education so that patients with tendinopathy can self-manage their condition. Patients recognised the value of education and self-management strategies, in order to enhance their self-efficacy, a view that was echoed by physiotherapists:

> *Having a little bit of pain does not mean to say that you should not be doing the exercises. So as long as it is not getting really bad, that guidance on how to manage the pain aspect of it now that I am thinking about it, was very handy because it gives you framework to decide well is this normal aches and pains or is it something a bit more serious. (P 5) (p. 7)*
>
> *[Patient; Achilles][152]*

> *It's about trying to reduce anxiety through education or reassurance and to reduce any hypervigilance, which actually may affect their outcome … and ultimately affect their adherence to any exercise intervention. (P1, PT) (p. 3)*
>
> *[Physiotherapist; RCRSP][159]*

Integration of quantitative and qualitative evidence

Qualitative findings in this review largely support and explain the quantitative findings (see *Table 32*) and can be summarised as follows.

Feasibility

Adherence

Synthesised quantitative findings from 52 studies provide evidence that self-reported adherence to exercise therapy for tendinopathy is good when interpreting 'good' as ≥70% adherence. Synthesised findings from 13 quantitative studies show that attendance of supervised exercise therapy sessions (e.g. 1–1 physiotherapy) is excellent (90%). The qualitative findings help to explain why adherence is not even higher than 70% however, as a number of factors including barriers, facilitators, beliefs, previous experience and the 'therapeutic alliance' affect adherence in an individualised manner. The qualitative findings also explain adherence to supervised exercise being higher than unsupervised exercise, with patients expressing reduced confidence when unsupervised.

Fidelity

There is a lack of data on fidelity of exercise in the included studies. Quantitative evidence from three studies shows that exercise fidelity is variable. Qualitative findings relating to confidence in supervised more than unsupervised exercise may help to explain this finding.

Acceptability

Tolerability

Quantitative evidence from 15 studies shows that exercise therapy for tendinopathy is tolerated well. Although it is associated with some short-term increase in pain or muscle soreness, it results in relatively few adverse events or drop-outs. Studies with higher drop-outs appear to be those employing pain-inducing exercise. Qualitative findings provide an explanation for the range in tolerability reported in quantitative findings.

TABLE 32 Juxtaposition of findings from individual syntheses

Quantitative findings		Qualitative findings
Feasibility		
Adherence	*Estimated mean proportions* Adherence: 0.76 (95% CrI 0.71 to 0.80] 'Good' adherence: 0.79 (95% CrI 0.68 to 0.87) *Narrative synthesis* 11/13 studies adherence ≥ 70% Lower adherence for 1 upper-limb strengthening programme; adherence > 70% with forearm band and < 70% without, suggesting relationship between pain and adherence Lower adherence for do 'as tolerated', suggesting relationship between pain and adherence	*Explanatory* A number of reasons why adherence not > 70% Facilitators: motivation, personality, social support, setting and intervention itself Barriers: confidence, motivation, pain, lack of time Beliefs about benefits of exercise Previous experience Importance of patient–therapist relationship for facilitating adherence and self-management through promoting patients' motivation and confidence; may impact both positively and negatively Importance of education and self-management to enhance self-efficacy for self-management
Attendance	Estimated mean proportion 0.90 (95% CrI 0.82 to 0.96)	*Explanatory* Importance of education and confidence provided by physiotherapist
Fidelity	Only reported in 3% of included studies Fidelity ranged from 23% to 90%, but different variables being measured: 90% fidelity for prescribed load 23% to 50% when all exercise parameters included in calculation One study unclear exactly how fidelity was measured	*Explanatory* Confidence; less confident for unsupervised exercises that they are conducting them correctly
Acceptability		
Tolerability of exercise	*Using scales* 2 studies used different Likert scales 3/4 for supervised RCRSP 6.3/10 for painful eccentric HEP Achilles *Drop-outs due to exercise intolerance* Only reported in 7% studies 0 to 33% participants; most studies ≤ 11%; one study 33% drop-outs was small sample (n = 9) and painful quadriceps training for patellar tendinopathy *Adverse events related to exercise* Only reported in 8% studies Exercise generally associated with some short-term pain or muscle soreness (reported by 1% to 60% of participants)	*Explanatory* Most patients will tolerate some discomfort if believe exercise to be beneficial *Explanatory* Pain response highly individualised – same exercise intervention liked by some patients and disliked by others due to causing pain Pain–exercise relationship; important to know when (not) to push through pain Symptomatic improvement key facilitator to adherence; conversely, failure to respond, slow response or plateau key barrier
Satisfaction with exercise	2 studies (Achilles and RCRSP) Satisfaction good (supervised exercise); however, no details of scale used	*Confirmatory/contradictory* Range of individualised views suggesting range of satisfaction levels
Willingness to do exercise programme	1 study 100% willingness to undertake exercise programme (Achilles, supervised)	Not specifically explored in qualitative studies

TABLE 32 Juxtaposition of findings from individual syntheses (*continued*)

Quantitative findings		Qualitative findings
Helpfulness of exercise	1 study (iliopsoas) Specific exercises helpful – no clear consensus on which, suggesting individualised experience/preference	*Confirmatory* Patients can have conflicting views of the same exercises e.g. 'simple' RCRSP exercise liked by some, whilst others questioned efficacy
Overall acceptability	1 study (Achilles) Easy to implement painful eccentric HEP (Achilles)	*Not explored in quantitative studies* Environment Group vs. individual exercise – some patients prefer group environment due to peer support, learning and motivation Gym-based telerehabilitation supervised remotely – both barriers and facilitators reported. Potentially important due to changes in healthcare provision during COVID-19 pandemic and 'new normal'

Beliefs about the pain–exercise relationship, the individualised response to pain, and the impact of symptomatic response all moderate an individual's tolerability of therapeutic exercise.

Satisfaction, willingness, helpfulness, overall acceptability

These acceptability measures were reported in one or two quantitative studies each, with few data provided. Findings were positive for all domains. Qualitative evidence confirms the findings from one case-series (n = 9) that individual patients can have conflicting views on the helpfulness of specific exercises. Qualitative evidence provided an understanding of some aspects that were under-reported in the quantitative evidence, including environmental factors such as group and gym-based exercise, and the use of remote supervision via telerehabilitation.

In summary, both the quantitative and qualitative evidence indicates that exercise therapy for tendinopathy is largely feasible and acceptable. The qualitative evidence indicates that an individualised person-centred approach to prescribing exercise therapy, facilitated by a strong therapeutic alliance between patient and healthcare provider, with provision of appropriate and meaningful education, is important for achieving the confidence and motivation required for adherence.

Discussion

To our knowledge, this is the first review to synthesise the available quantitative and qualitative evidence on feasibility and acceptability of exercise therapy for tendinopathy. Feasibility and acceptability are important considerations if exercise interventions are to be conducted outwith controlled experimental settings and adopted in the real-world clinical environment.

The quantitative data showed evidence that self-reported adherence and attendance to supervised exercise are good, and that fidelity is seldom reported in studies on exercise for tendinopathy. It also showed that the acceptability of exercise for tendinopathy is overall good.

The qualitative data highlight a range of factors that impact on feasibility and acceptability of exercise. These include the need for an individualised person-centred approach, facilitated by a strong therapeutic alliance between patient and healthcare provider, with provision of appropriate patient education. These factors need to be considered when designing and delivering services for people with tendinopathies. However, as interventions are increasingly tailored to individual patient needs, the way and rationale for such adaptations will need to be captured and recorded when describing interventions in research studies to allow for comparisons and assessments of effectiveness.

Feasibility

The findings related to adherence can be interpreted in a number of ways. On face value adherence appears to be good across tendinopathies and exercise types, and is congruent with levels reported in previous systematic reviews exploring exercise adherence in a range of health conditions.[194–196] However, we used authors' own statements of adherence, which at times involved making an assumption that authors were interpreting a particular proportion of exercises completed (e.g. 70%) as being good. Without an agreed definition of 'good' adherence however, this remains open to interpretation, and it must be acknowledged that self-report measures are subject to bias.[197] Bailey *et al.*[171] in their systematic review of 459 studies on adherence to therapeutic exercise for musculoskeletal pain, found proportions of 80–99% to be most commonly used for determining satisfactory adherence; it is therefore possible that our 70% threshold was somewhat generous.

Bailey *et al.*[171] also found adherence to be variably defined and measured, and recommended that adherence to therapeutic exercise for musculoskeletal pain should be conceptualised in order for a measurement tool to be developed. A Cochrane review on exercise for chronic musculoskeletal pain published more than a decade ago called for a validated measure of exercise adherence to be developed and adopted.[198] The current review shows that work remains to be done in this field, supporting Bailey *et al.*'s recommendations. Conceptualising and defining adherence to exercise therapy would enable a common language among clinicians, patients and researchers, and development of a measurement tool (or suite of tools) would facilitate collection of robust and suitably homogeneous data which, if adequately reported, would assist with future primary research and evidence syntheses.

The qualitative findings identified the importance of barriers, facilitators, beliefs, previous experience and the 'therapeutic alliance', all of which can impact adherence in a positive or negative manner, adding to the complexity of achieving high levels of adherence to therapeutic exercise. These findings are in keeping with the knowledge that numerous factors influence adherence to exercise interventions, including characteristics of the intervention itself, and factors associated with those delivering and receiving it.[195,199] The findings may assist with the development of strategies to support adherence to exercise for tendinopathy, which might include booster sessions and telephone follow-up, which have shown promising results in people with osteoarthritis.[200] It has been suggested that mobile health interventions may be useful for exercise adherence in musculoskeletal conditions; however, further research on their efficacy is required.[201]

The finding of high rates of attendance to supervised exercise may be in contrast to some attendance rates typically seen in the clinical setting, and may be a function of research participation, indicating the need for more pragmatic effectiveness studies to be undertaken. It may also be a function of patients feeling more confident with supervised than unsupervised exercise, as explained by the qualitative findings, and therefore motivated to attend. There is substantive evidence across conditions and populations that supervised exercise is superior to unsupervised,[195,202,203] including the efficacy review reported above. However, supervision can be achieved remotely, as demonstrated in this review.[152] Telehealth may therefore provide a cost-effective method of supporting adherence in this population, and is worthy of further research.

The finding of poor reporting of fidelity is important. If we are to truly determine the effectiveness of specific exercise approaches for tendinopathy (and for specific tendinopathies) it is vital to know whether the exercise is being conducted as intended or whether a modified version is in fact proving effective. It will also help, along with further qualitative work, to understand which aspects of exercise programmes or specific exercises patients find acceptable and unacceptable. Fidelity is arguably not easy to assess; however, with the proliferation of exercise tracking and remote monitoring technologies,[204] there is scope for this to be greatly enhanced in the future.

Acceptability

The acceptability findings need to be interpreted with caution, with the main finding being limited reporting of acceptability in quantitative studies. The qualitative studies suggest the experience of exercise for tendinopathy to be a highly personalised one, with many factors impacting the patient experience, and the patient–therapist relationship being highly important.

Limitations

There was considerable heterogeneity in reporting of feasibility and acceptability measures. In order to facilitate synthesis of adherence data, which was most commonly reported, we required some form of numerical data to be reported. This did result in the exclusion of some studies on the basis of insufficient data (e.g. those that made general statements about adherence being 'good' without providing any quantification). Furthermore, we only reviewed studies which reported adherence, meaning that 347 of 436 potential quantitative studies identified in the scoping review were automatically excluded (i.e. they did not report adherence).

We did not contact authors for missing data. This was a pragmatic decision due in part to the size of the syntheses being undertaken in phase 2 (efficacy and mixed-method reviews), and in part due to the widely acknowledged challenges in collecting feasibility and acceptability data, particularly self-reported exercise adherence, arguably making it unlikely that study authors would be able to provide such data. Our scoping review found that only 59% of studies that intended to collect adherence data actually reported it, and almost 65% did not address adherence at all. Therefore, adherence reporting appears to be variable and selective, and is an important methodological area to address in future research. We also found in this mixed-method review that reporting of other feasibility and acceptability measures was uncommon.

When adherence was reported, there was no consistency on what constitutes 'good' adherence, as discussed above. Our findings concur with those of Bailey *et al.*[171] on the need for a clear definition and robust methods of measuring and reporting adherence. Our findings also concur with views presented recently highlighting the importance of adherence when interpreting the results of exercise interventions.[205]

The lack of operational definitions for feasibility and acceptability measures was salient and impacted on our ability to synthesise findings and draw conclusions. Our findings demonstrate that reporting of feasibility and acceptability measures is in general poor within the exercise for tendinopathy literature, suggesting that clear definitions should be agreed for all relevant measures in order to facilitate a common language and understanding, and allow for comparisons and future evidence syntheses to draw firm conclusions.

Methodological quality of quantitative studies was moderate to high. Blinding of participants and those delivering treatments is understandably challenging in exercise studies. However, it should be possible to ensure blinding of outcomes assessors and adequate description and analysis of follow-up. Qualitative studies were likewise moderate- to high-quality, with scores reflecting limitations of the critical appraisal tool rather than individual studies.

We deviated from the original protocol to undertake a segregated rather than integrated synthesis of quantitative and qualitative findings. Following full-text screening it became clear that the quantitative and qualitative studies addressed different aspects of feasibility and acceptability, and therefore required separate syntheses to understand these different aspects. This avoided 'qualitising' the quantitative data and allowed us to conduct meta-analyses on the adherence data, prior to integrating findings from the separate quantitative and qualitative syntheses, resulting in confirmatory and explanatory results being presented.

Limiting inclusion to studies ranked 'very high' on the HDI may have excluded potentially relevant high-quality studies, as some tendinopathy research is conducted in, for example, Brazil and South Africa. However, the numbers excluded on this basis were not large, and as well as making the review manageable, the findings are arguably more generalisable to the UK.

Heterogeneity of the quantitative data combined with the small number of qualitative studies limits generalisation. We were only able to draw general conclusions and not make recommendations specific to tendinopathy types or other covariates. Some qualitative findings were dominated by one or two studies (e.g. one study on gym-based telerehabilitation and two studies on the same RCRSP intervention generated a large number of findings), therefore these results need to be interpreted with some caution.

Conclusions

The findings show that exercise therapy for tendinopathy is in general feasible to deliver and acceptable to undertake. They also highlight a number of important factors that should be considered when prescribing therapeutic exercise for individuals with tendinopathy. These include: an awareness of potential barriers and facilitators to engaging with exercise, the potential impact of prior experience and beliefs (both patients' and healthcare professionals'), and the importance of patient education, self-management and the patient–healthcare professional relationship.

There is a need for future research to adequately measure and fully and accurately report feasibility and acceptability of exercise for tendinopathy; that will require definitions and standardised approaches to outcome measurement to be developed and adopted. There is also a need for further high-quality qualitative research to augment the body of knowledge provided here to further understand patients' and healthcare professionals' views and experiences across a range of exercise approaches, delivery types and tendinopathies. This will lead to a deeper understanding of this complex phenomenon, providing explanations for the findings of the future pragmatic effectiveness studies that are also urgently required. Finally, future studies should evaluate different modes of delivery of exercise therapy for tendinopathy, including individual, group, supervised, remotely supervised and unsupervised.

Chapter 7 Discussion

To our knowledge, this is the first body of work to provide a comprehensive map of the evidence base for exercise therapy in the management of tendinopathy, and to generate synthesised findings regarding their efficacy, feasibility and acceptability. All reviews conducted in this body of work followed a priori protocols and were conducted in accordance with current methodological guidance.

The scoping review provided a detailed overview of exercise interventions for tendinopathy and the related health domains and outcomes including study design and participant demographics reported. The findings from the scoping review identified recommendations for future tendinopathy research. These included the need for specific high-quality primary research, especially adequately powered and rigorous efficacy studies and qualitative studies of patients' lived experience, comprehensive reporting and more high-quality evidence syntheses. Importantly, combined with stakeholder engagement activities, the scoping review informed the design and methods used in the contingent efficacy and mixed-method reviews.

Given the extent of previous research investigating different exercise therapies, tendon locations and populations, the contingent efficacy review was split over a series of sub-reviews. The extensiveness of the data obtained provided a unique opportunity to adopt a modelling-based approach to generate novel findings and explore the heterogeneity to address the review questions. Collectively, the sub-reviews and included meta-analyses explored the distribution of effects that should be expected from exercise therapies and the factors likely to influence these across different tendon locations. The efficacy reviews also included comparative meta-analyses attempting to establish which exercise therapies were most beneficial and efficacious in relation to non-exercise and combined exercise and non-exercise therapies. To enhance the clinical relevance of findings from the efficacy reviews, the final mixed-method contingent review provided an understanding of some of the important acceptability and feasibility factors that influence exercise therapy efficacy in the real-world clinical setting. Several recommendations can be made from this body of work. This chapter presents an overview of the main findings, the strengths and limitations of this body of work, and makes recommendations for practice, research and policy.

Main findings

The main findings are presented in relation to the five objectives addressed by this mixed-methods evidence synthesis project.

What exercise interventions have been reported in the literature and for which tendinopathies? (scoping review)

The scoping review identified a range of exercise therapies being used across different tendinopathies (predominantly RCRSP, Achilles, patellar and lateral elbow) in the 555 included reports. Strengthening exercise was the most dominant exercise type reported, with eccentric strengthening most frequently reported for three common tendinopathies (Achilles, patellar, lateral elbow). Flexibility exercise was more commonly reported in the upper limb, and exercise therapy for RCRSP demonstrated the greatest heterogeneity. Reporting of exercise interventions according to the TIDieR checklist[55] was highly variable, with few interventions being fully reproducible, and reporting of exercise adherence being infrequent and poor in quality and completeness. These findings in combination with stakeholder workshops directly informed what data were appropriate to extract and synthesise in the contingent reviews.

What outcomes have been reported in studies investigating exercise interventions for tendinopathy? (scoping review)

The scoping review identified that a range of health domains were reported, with disability being the most common primary health domain for RCRSP, Achilles and patellar tendinopathies, and PFC for lateral elbow tendinopathies. For secondary health domains, participant rating of overall condition was most common for Achilles and patellar, disability was most common for RCRSP, and PFC was most common for lateral elbow. Adverse effects/events and cost effectiveness were rarely reported as either primary or secondary health domains.

The scoping review also identified that a range of outcome domains and measurement tools were reported, with lack of consensus between and within tendinopathies being a key finding. Impairment-based outcomes were dominant, with less reporting of psychosocial factors, which are arguably important in any health condition, particularly one requiring adherence to an exercise programme. It is anticipated that this lack of consensus will be addressed in time by the ICON group[51] who are working to establish core outcome sets for individual tendinopathies (including Achilles, GTPS, proximal hamstring and lateral elbow) as well as psychological and psychosocial outcomes. The mapping of outcome domains and measurement tools, combined with the views obtained from patients and professionals in the stakeholder engagement activities, directly informed the outcomes for the efficacy reviews.

Another key finding from the scoping review was the limited reporting of participant demographics, including comorbidities and potential confounders, which limited the analyses that could be conducted in phase 2 of the project. We had anticipated that subgroups and covariates such as symptom severity, chronicity, age, sex, activity levels, BMI, comorbidities, health behaviours and medication use might be incorporated within meta-analyses to explain heterogeneity of individual treatment effects. However, this was not possible due to the limited, incomplete, imbalanced or, in many cases, absence of such variables. In many instances adequate reporting of potentially relevant covariates (e.g. BMI, physical activity level, symptom severity or variation in symptom duration) occurred in less than half of the included studies, precluding any relevant analysis. Similarly, a lack of variation in key covariates was identified such as age, with an interquartile range (for mean age) of participants only 43 to 49 years old preventing suitable analysis.

Therefore, the scoping review produced a body of knowledge on the extent and content of the evidence base on exercise for tendinopathy and allowed important design decisions to be made regarding the contingent syntheses, to address the review questions as fully as possible. It also led to a to the development of initial criteria to inform guidance for exercise reporting in tendinopathy research, which can be further developed into a taxonomy beyond this project to ensure consistency in future reporting. Recommendations for research centred on study types, reporting standards, adherence and the need for research on the lived experience of exercise for tendinopathy.

Which exercise interventions are most effective across all tendinopathies? (contingent synthesis 1: efficacy)

and

Does type/location of tendinopathy or other specific covariates affect which are the most effective exercise therapies? (contingent synthesis 1: efficacy)

The scoping review directly informed the extent to which these questions could be addressed, due to the availability of suitable data for inclusion in the meta-analyses conducted for contingent synthesis 1. The key findings of the efficacy reviews are summarised below, indicating that it was possible to address question 3 and to partially address question 4 in relation to location of tendinopathy and a limited number of other specific covariates; however, there were insufficient data to draw conclusions relating to covariates such as age, gender, BMI and training status (e.g. general population, trained athlete, performance athlete), which were identified a priori and from stakeholders as potentially clinically relevant.

The key findings of the efficacy reviews were:

Relative to baseline assessment, a reasonably wide distribution of changes and, in general, improvements should be expected following exercise therapy for tendinopathy. The magnitude of improvement appears somewhat independent of the location of the tendinopathy, but is strongly influenced by the outcome domain, with the greatest improvements measured in subjective patient-reported outcomes (e.g. disability, function, pain) and the smallest improvements measured in QoL and more objective outcomes (e.g. PFC and ROM).

In combination with the relatively wide distribution of changes that can be measured, our findings suggest that small but probably clinically relevant systematic shifts in central tendency can be expected from factors such as assessment duration and exercise supervision, with greater improvements as time increases from baseline assessment and with exercise therapies that are supervised.

The findings from the efficacy reviews show that, where reported, the number of adverse events experienced during exercise therapies is extremely low. In addition, most patients report that they are satisfied with exercise-only therapies and that the changes experienced are viewed positively.

As identified by the scoping review, exercise therapies are generally dominated by resistance exercise. However, most therapies appear to prescribe exercise regimes with inadequate intensity to realise the full potential of the unique biomechanical stimulation possible with resistance exercise. Many exercise therapies hardly approached one-repetition maximum contraction and often used only the mass of a limb or the whole body for resistance. Where external resistances were included, these were generally low in intensity, as sets of exercise generally comprised at least 15 repetitions rather than the four to eight which may be required for intense overload training. In addition, most therapies included very high frequencies, with resistance training often prescribed at least twice per day, rather than two to three times per week, which is recognised as the optimum for resistance training and consistent with basic science requirements for improved tendon structure and function. Meta-regressions highlighted that those therapies which featured greater resistances and lower frequencies tended to generate greater mean improvements.

A relatively small number of studies were identified that directly compared exercise-only therapies. In addition, due to the high prevalence of resistance-dominated therapies, comparisons of different exercise therapies were more limited. However, the comparative efficacy reviews identified that for tendinopathies such as RCRSP, therapies that comprise more of a flexibility or proprioceptive focus may be more beneficial than those that focus on resistance exercise. In addition, where resistance exercise was the focus, this frequently comprised eccentric-only exercises. Whilst evidence was identified for increased efficacy of eccentric-only exercises compared with isometric or concentric-only exercises, evidence was also identified for the superiority of standard concentric and eccentric exercises. These findings are potentially influenced by the relatively low resistances and high training frequencies typified by the exercise therapies analysed.

Comparisons of exercise-only, non-exercise only and combined therapies in the final analyses of the efficacy reviews generated several important findings. Firstly, it was identified that non-active therapies (e.g. placebo and wait-and-see) tended to perform worst, highlighting the importance of active therapies. Secondly, evidence was obtained indicating greater improvements when combining exercise and non-exercise therapies compared with either therapy class in isolation. Finally, due to the large amount of heterogeneity present, development of a clear treatment hierarchy was not possible; however, evidence suggested that combining exercise with either electro-therapy, injections or kinetics (e.g. taping, splinting, orthotics) may produce the most effective results.

The efficacy reviews therefore provided evidence that:

(i) Exercise therapy is safe and beneficial across the common tendinopathy locations, and patients are generally satisfied with the outcome of exercise interventions and perceived substantive improvements.
(ii) RCRSP may benefit from exercise interventions that focus on flexibility and proprioception more than strengthening.
(iii) Resistance training combining both concentric and eccentric repetitions is superior to other contraction modes given the intensities and frequencies commonly adopted.
(iv) Combining exercise therapy with electro-therapy, injections or kinetics may be most beneficial across tendinopathies and may be considered in the early phase of tendinopathy rehabilitation.

It is important to state that many of the findings of the efficacy reviews were underpinned by low and very low quality of evidence. Whilst overall risk of bias was generally low, frequently there were limitations associated with blinding of both participants and outcome assessors. Additionally, in keeping with the findings of the scoping review, limitations were noted in overall reporting, which introduced further risk of bias, and restricted the capacity of the efficacy reviews to delineate the effects of exercise dose or draw firm conclusions on the superiority of specific exercise types or protocols across tendinopathy per se or its subgroups. This must be rectified in future research, where high-quality, adequately powered studies must be conducted and reported fully and transparently with more detail describing the actual exercise stimulus, including for example the magnitude of the resistances used. Limitations also exist in the ability to make conclusions based on the complexity of the issues and the large number of potentially relevant factors. For example, our finding that combined therapies are more efficacious than any one form of therapy alone may simply be due to the dosage and it is plausible that similar or better results could be achieved with greater doses of a single modality. Nevertheless, increased quality and better reporting in primary studies will enable subsequent evidence syntheses to adopt more robust analyses, improving the overall confidence in findings generated.

How feasible and acceptable are exercise interventions for tendinopathies? (contingent synthesis 2: feasibility and acceptability)

The mixed-method review identified that exercise interventions for tendinopathy can largely be considered feasible and acceptable. However, the findings should be interpreted with some caution as there remains a need for feasibility and acceptability measures to be adequately defined and measured in tendinopathy research, particularly those measures of adherence to therapeutic exercise. It was not possible to identify whether specific intervention types were more or less feasible/acceptable, or for which tendinopathies, due to small amounts of heterogeneous data in the quantitative studies and the small number of qualitative studies.

By integrating quantitative and qualitative findings this review highlighted important patient-centred factors to consider when prescribing exercise for tendinopathy that can influence feasibility and acceptability measures, particularly confidence to adhere to a therapeutic exercise programme. These include an awareness of potential barriers and facilitators to engaging with exercise, the potential impact of prior experience and beliefs (both patients' and healthcare professionals'), and the importance of patient education, self-management and the patient–therapist professional relationship.

The review identified a need for future research to adequately measure and fully and accurately report feasibility and acceptability of exercise for tendinopathy, requiring definitions and standardised approaches to outcome measurement to be agreed upon by the tendinopathy research community. The review also identified a need for further high-quality qualitative research to explore the complexities of exercise therapy from the perspectives of those experiencing it. Finally, the review identified a need to evaluate different modes of delivery of exercise therapy, as few studies have to date fully explored aspects such as supervision, delivery (including by telehealth) and group dynamics.

Strengths

A strength of this evidence synthesis programme of work is that it included all tendinopathies, and all forms of exercise therapy. Previous systematic reviews have tended to focus on one or a small combination of tendinopathies (e.g. Achilles and patellar) and selected exercise approaches, which does not generate comparative evidence for specific exercise interventions. The inclusive approach adopted here has allowed us to show that approaches generally used to manage different tendinopathies are likely to create similar responses. Additionally, many previous approaches to evidence synthesis have relied on narrative synthesis, meaning that the large amount of previously published data has not been explored as well as could be achieved. The modelling approaches featured in both the efficacy and mixed-methods reviews attempted to synthesise these data, identifying general results and where possible exploring heterogeneity to generate novel and clinically relevant findings. In addition, the inclusive approach with regard to tendinopathies, participants, therapies and outcomes enabled the review to synthesise diverse sets of information from both the clinicians' and patients' perspectives to provide the most comprehensive summary of the field to date.

Another strength is the inclusion of studies published in languages other than English, which are frequently excluded from systematic reviews. We used automated translation for some studies and sought translation and assistance with data extraction from the review team's networks for others; very few studies were excluded due to not being able to secure an English translation.

The results of the mapping of different exercise types, when combined with the proposed criteria in the TIDieR checklist, enabled us to develop initial criteria to guide reporting of exercise for tendinopathy. Further development of this initial guidance is required to establish a comprehensive taxonomy for exercise reporting. The use of a taxonomy to guide consistent reporting of exercise interventions in future tendinopathy research studies will enable better comparisons to be conducted.

Limitations

The use of the HDI was a pragmatic approach that ensured the review was feasible to conduct and that the findings would be relevant to the UK setting. However, the review team acknowledge that some potentially relevant studies were excluded on this basis.

This work identified limitations in the available body of evidence on exercise therapy for tendinopathy. Many key variables lacked clearly agreed definitions and/or methods of measurement, particularly those relating to feasibility and acceptability of exercise therapy. The lack of consensus on outcome domains and measures was clear, and points to the urgent need for core outcome sets not only to be developed but adopted in practice and research. Reporting of exercise interventions themselves lacked clarity, particularly with respect to dosage, and the insufficient reporting of participant factors made it difficult to explore informative heterogeneity and control for confounding in the meta-analyses. There was a lack of qualitative research that explored participants' and healthcare professionals' perspectives of exercise for tendinopathy; nonetheless the 11 qualitative studies included in the mixed-method review provided valuable insight to explain some of the findings from the quantitative component of that review and complemented the efficacy review findings.

The modelling of data from heterogeneous studies with regard to interventions, samples and outcomes poses a range of limitations and therefore requires caution when interpreting findings and making recommendations. These limitations are particularly salient in efficacy review 1, where data were extracted and compared from individual exercise-only therapies. It is expected that an extensive range of factors can influence the outcomes of any interventions measured, and that imbalances of these factors across comparisons may influence findings. Attempts were made to explore the heterogeneity through sub-analyses stratifying for factors such as tendinopathy location and outcome domain.
In general, sub-analyses tended to show consistent results and match with plausible mechanisms providing some additional support for the findings generated. However, it is possible that imbalances of other relevant factors remained. Additionally, where attempts were made to explore heterogeneity

through meta-regressions, it was not always possible to create variables that fully represented the construct of interest, including the use of body mass or additional external resistance to control for resistance intensity. Overall, the strength of analyses would have been improved with greater depth and consistency of reporting enabling more control of factors such as assessment duration and participant and exercise therapy characteristics. However, sufficient data were generally not available to control for these factors based on the number of studies available and the quality of reporting in individual studies.

The quality of evidence underpinning the findings of this review varied across the different sections, with low and very low quality of evidence frequently used for the efficacy reviews. In addition to some concerns with risk of bias, evidence quality was frequently downgraded due to issues of imprecisions, inconsistency and small-study effects. Imprecision and inconsistency reflect the heterogeneous nature of the research base, where not only the patients and therapies differ substantively, but also the focus of authors and the highly specific research questions addressed. There are thus additional limitations when synthesising data and drawing findings such as that multiple therapies are superior to individual therapies, when this is rarely the focus of the individual studies that are amalgamated to build the indirect evidence. The mixed-method review was likewise limited by the variable reporting quality of exercise adherence data, meaning that these results should also be interpreted with some caution. In addition, the well-documented limitations of self-reported measures of adherence should also be acknowledged. Finally, mixed-methods reviews are somewhat complex and may be challenging to replicate. However, we are confident in the rigour of the methods adopted for this component of the synthesis.

Recommendations

Collectively, the findings from the scoping, efficacy and mixed-method reviews contributed to the following recommendations.

Recommendations for practice

1. When setting expectations of what treatment effect to observe in practice, clinicians should consider the outcome domain. Subjective tendinopathy-specific outcomes may result in very large changes compared to objective outcomes. The observed reduction in QoL in some studies requires further exploration.
2. Patient satisfaction appears to be consistently moderate to high. In addition to measuring satisfaction on a binary scale, clinicians may choose to probe reasons for satisfaction or dissatisfaction to better inform practice.
3. Whilst resistance exercise is the most common class of exercise therapy, it appears to be mostly used with limited intensity and high frequencies. Adhering to practices that take advantage of a more optimum exercise stimulus should be encouraged, with lower frequency and higher intensity likely beneficial for lower-limb tendinopathies. Resistances are also infrequently prescribed based on a percentage of maximum; however, this is one of the most effective means of ensuring that resistances are of sufficient magnitude. Practices to achieve loading in line with standard exercise theory which patients can adhere to require development, implementation and investigation.
4. For RCRSP the use of flexibility and proprioceptive regimes may be more effective than using resistance exercise in isolation. There is also some limited evidence that flexibility regimes may be effective in AT.
5. A focus on eccentric resistance exercise above all other treatments does not appear warranted. It is likely that standard resistance exercise practices that combine concentric and eccentric exercise will be superior to eccentric-only and be easier to implement in practice. This requires further investigation.
6. Combining exercise with other therapies such as electro-therapy, injections and kinetics may be more effective than exercise in isolation. It is common for exercise to be the first line and then for

additional modalities to be added in recalcitrant cases. Models that include multiple modalities earlier in the therapeutic process could be considered; however, further research, including longer-term follow-ups, is required.
7. In order for the benefits of effective exercise therapy interventions to be realised, clinicians should adopt an individualised, person-centred approach to prescribing exercise therapy. Building a strong therapeutic alliance between patient and healthcare provider is vital, as is the provision of appropriate and meaningful education on tendinopathy and its management, to promote the confidence and motivation required for adherence to and fidelity with exercise therapy interventions and particularly for self-management.

Recommendations for research

Outcome measurement and transparent reporting

1. Reporting needs to be greatly enhanced in studies of exercise therapy for tendinopathy. This includes increased use of reporting checklists such as CONSORT,[206] TIDieR[55] or CERT[207]; full and transparent reporting of all outcomes collected (primary, secondary, acceptability); full reporting of participant characteristics and analyses by relevant subgroups (e.g. age, gender, activity level, comorbidities). Detailed reporting of exercise intervention details, particularly where dose can be effectively quantified (e.g. absolute and relative loads), will facilitate greater consistency across future studies and enable dose-response meta-analyses to be more precise. This is essential for translation to clinical practice, with implementation science approaches needed to bridge the research–practice gap. Further development and validation of our proposed outline reporting guidance of exercise for tendinopathy as a comprehensive taxonomy would greatly assist in enhancing reporting, allowing for future comparisons and evidence syntheses.
2. Use of standardised outcome measures that are fully and transparently reported would facilitate future meta-analyses. The observed reduction in QoL in some studies requires further exploration, but an overall measure of well-being and potentially the influence of tendinopathy on an individual's well-being should be routinely collected in research.
3. Quantification of adherence suggests that it is relatively high, which contrasts with qualitative findings on barriers to adherence and with feedback obtained in stakeholder workshops. A clear definition of adherence needs to be agreed and methods to reliably measure it developed, so that future studies are not reliant on self-report alone.
4. Fidelity to exercise therapy is rarely measured. Whilst adherence may be reasonable, if fidelity is low, particularly with regard to the intensity of activity, exercise therapies are unlikely to be as effective as they can be, synthesised across studies or understandable in terms of biological mechanisms. This should be measured and reported more accurately, and methods for promoting and measuring fidelity are worthy research goals.

Intervention development

5. Exercise therapy interventions should be carefully developed and tested, including establishing feasibility and acceptability, prior to moving to studies of efficacy and effectiveness.

High-quality primary research

6. There is sufficient research to demonstrate the efficacy of exercise therapy. There is still a need for high-quality adequately powered research to continue to better identify the dose parameters and their interactions with patient characteristics to identify best-practice approaches.
7. There is a need for increased true effectiveness studies such as pragmatic trials to better quantify the effectiveness of current and developing therapeutic models.
8. There is a need for increased cost-effectiveness research which may also investigate models that include multiple modalities earlier in the therapeutic process.

9. Further high-quality qualitative research exploring patients' and healthcare professionals' perceptions and experiences of exercise for tendinopathy would add to the small body of qualitative work reported here, allowing a greater depth of understanding of the factors that impact on efficacy of exercise therapy and implementation in the real-world clinical setting.
10. Further research may be required to identify why clinicians and researchers are tending to use low-intensity and high-frequency resistance exercise and to explore any barriers from the patient perspective.[55,206,207]

Recommendations for policy

1. Research funders and providers of services need to fund and facilitate research within different care settings (including remote and group) to enable cost-effectiveness, acceptability and adherence comparisons between different modes of delivery of exercise therapy interventions for tendinopathy.
2. Service provision may need to be adapted and funded to allow a person-centred approach to care and access to additional non-exercise treatment modalities when appropriate. This could include the need for extended periods of intervention to be available in order that the timescales of physiological tendon change are reflected in interventions.
3. The use of technologies which can facilitate better patient engagement with treatments and more consistent self-reporting of adherence, outcomes and side effects should be explored.

Conclusion

This comprehensive, robust, inclusive mixed-methods evidence synthesis has provided an extensive map of the contemporary research on exercise for tendinopathy, evaluated the efficacy of exercise across the common tendinopathies and identified what is known about the feasibility and acceptability of exercise for tendinopathy from patients' and providers' perspectives.

Analysing the results of 555 studies has shown that reporting of exercise therapy in tendinopathy studies needs to improve. The use of common terminology, definitions, outcome sets and reporting guidance is imperative for high-quality evidence to be produced in order for conclusions to be drawn on effectiveness of specific exercise interventions for specific tendinopathies.

It is clear that there is little value in the accumulation of tentative findings from further low-quality studies and instead there is an urgent need for high-quality research that addresses clinical and cost effectiveness. There remains a need for detailed work on mechanisms explaining symptomatic and biological response.

Nonetheless, the findings of this comprehensive set of reviews support the use of exercise therapy combined with non-exercise adjuncts across tendinopathies, the use of flexibility and proprioception exercise for RCRSP, and combining eccentric and concentric exercise in resistance programmes. The findings show that exercise therapy is safe and efficacious across tendinopathies, and that patients are typically satisfied with the delivery and related outcomes. However, these outcomes need further improvement and research to address the identified deficits in the evidence-base. The findings also show that patient and healthcare provider beliefs and prior experience need to be considered, as do barriers and facilitators to engaging with exercise, and the importance of patient education, self-management and the patient–healthcare professional relationship.

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Publications

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Data-sharing statement

All data requests should be submitted to the corresponding author for consideration. Access to anonymised data may be granted following review.

Ethics statement

Ethical approval was not required due to this project being literature-based, with members of the public and healthcare professionals involved in stakeholder engagement and not research activity.

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Appendix 1 Detailed search strategies

Search strategy scoping review

Search last updated 28 April 2020

Embase (Ovid)	(exercise OR exercise*.mp OR "isometric exercise" OR kinesiotherapy OR Eccentric.mp OR concentric.mp OR "heavy slow resistance".mp OR "isokinetic exercise" OR plyometrics OR "muscle stretching" OR "muscle training") AND (tendinitis OR Tendinopathy.mp OR "tendon injury" OR "shoulder injury" OR "rotator cuff injury" OR "tennis elbow" OR tendin.mp OR tendon.mp OR bursitis OR "shoulder impingement syndrome" OR 2posterior tibial tendon dysfunction" OR "Greater trochanteric pain syndrome".mp)
CINAHL (EBSCO-host)	(MH Exercise OR AB exercise* OR MH "muscle strengthening" OR MH "rehabilitation" OR MH "eccentric contraction" OR TX "heavy slow resistance exercis*" OR AB eccentric OR AB concentric OR AB isokinetic OR MH "therapeutic exercise") AND (MH tendinopathy OR MH "arm injuries" OR "tendon injuries" OR MH tendons OR TX tendin* OR TX tendon* OR AB bursitis OR MH Bursitis OR MH "Posterior tibial tendon dysfunction" OR MH "shoulder impingement syndrome" OR AB "Greater trochanteric pain syndrome")
MEDLINE (EBSCO-host)	(MH exercise OR AB exercise* OR MH "isometric contraction" OR MH rehabilitation OR TX eccentric OR TX concentric OR TX "heavy slow resistance" OR TX isokinetic) AND (MH tendinopathy OR MH "shoulder injuries" OR MH tendons OR MH "tendon injuries OR TX tendin* OR tendon* OR MH bursitis OR AB bursitis OR MH "posterior tibial tendon dysfunction" OR MH "shoulder impingement syndrome" OR AB "greater trochanteric pain syndrome")
SPORTDiscus (EBSCO-host)	(DE exercise OR DE "exercise therapy" OR AB exercise* OR TX eccentric OR TX concentric OR TX "heavy slow resistance" OR DE "isokinetic exercise" OR DE plyometrics OR DE "strength training" OR DE "stretch (physiology)" OR DE "isometric exercise" OR DE rehabilitation) AND (DE tendinitis OR DE tendinosis OR AB tendinopathy OR DE "tendon injuries" OR "shoulder injuries" OR DE "tennis elbow" OR AB tendin* OR AB tendon* OR DE bursitis OR AB "shoulder impingement syndrome" OR AB "posterior tibial tendon dysfunction" OR AB "greater trochanteric pain syndrome")
Amed (EBSCO-host)	(ZU exercise OR ZU "exercise therapy" OR AB exercise OR ZU "muscle stretching exercises" OR ZU "isometric contraction" OR ZU rehabilitation OR TZ eccentric OR TZ concentric OR TX "heavy slow resistance" OR TX isokinetic OR AB plyometric) AND (ZU tendinopathy OR ZU "tendon injuries" OR ZU tendons OR ZU "shoulder injuries" OR ZU "tennis elbow" OR TX tendin* OR TX tendon* OR ZU bursitis OR AB bursitis OR ZU "shoulder impingement syndrome" OR ZU "posterior tibial tendon dysfunction" OR AB "greater trochanteric pain syndrome")
Open Grey	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Mednar	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
New York Academy Grey Literature Report	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
EThOS	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Google Scholar	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
JBI Evidence Synthesis	Tendinopathy AND exercise

Cochrane Library	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
PEDro	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Epistemonikos	(tendinopathy OR tendon* OR tendin*) AND exercise
CORE	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Clinicialtrials.gov	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
ISRCTN	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
EU CTR	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
ANZCTR	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise

Search strategy efficacy reviews

Search last updated 19 January 2021

Embase (Ovid)	(exercise OR exercise*.mp OR "isometric exercise" OR kinesiotherapy OR Eccentric.mp OR concentric.mp OR "heavy slow resistance".mp OR "isokinetic exercise" OR plyometrics OR "muscle stretching" OR "muscle training") AND (tendinitis OR Tendinopathy.mp OR "tendon injury" OR "shoulder injury" OR "rotator cuff injury" OR "tennis elbow" OR tendin.mp OR tendon.mp OR bursitis OR "shoulder impingement syndrome" OR 2posterior tibial tendon dysfunction" OR "Greater trochanteric pain syndrome".mp)
CINAHL (EBSCO-host)	(MH Exercise OR AB exercise* OR MH "muscle strengthening" OR MH "rehabilitation" OR MH "eccentric contraction" OR TX "heavy slow resistance exercis*" OR AB eccentric OR AB concentric OR AB isokinetic OR MH "therapeutic exercise") AND (MH tendinopathy OR MH "arm injuries" OR "tendon injuries" OR MH tendons OR TX tendin* OR TX tendon* OR AB bursitis OR MH Bursitis OR MH "Posterior tibial tendon dysfunction" OR MH "shoulder impingement syndrome" OR AB "Greater trochanteric pain syndrome")
MEDLINE (EBSCO-host)	(MH exercise OR AB exercise* OR MH "isometric contraction" OR MH rehabilitation OR TX eccentric OR TX concentric OR TX "heavy slow resistance" OR TX isokinetic) AND (MH tendinopathy OR MH "shoulder injuries" OR MH tendons OR MH "tendon injuries OR TX tendin* OR tendon* OR MH bursitis OR AB bursitis OR MH "posterior tibial tendon dysfunction" OR MH "shoulder impingement syndrome" OR AB "greater trochanteric pain syndrome")
SPORTDiscus (EBSCO-host)	(DE exercise OR DE "exercise therapy" OR AB exercise* OR TX eccentric OR TX concentric OR TX "heavy slow resistance" OR DE "isokinetic exercise" OR DE plyometrics OR DE "strength training" OR DE "stretch (physiology)" OR DE "isometric exercise" OR DE rehabilitation) AND (DE tendinitis OR DE tendinosis OR AB tendinopathy OR DE "tendon injuries" OR "shoulder injuries" OR DE "tennis elbow" OR AB tendin* OR AB tendon* OR DE bursitis OR AB "shoulder impingement syndrome" OR AB "posterior tibial tendon dysfunction" OR AB "greater trochanteric pain syndrome")
Amed (EBSCO-host)	(ZU exercise OR ZU "exercise therapy" OR AB exercise OR ZU "muscle stretching exercises" OR ZU "isometric contraction" OR ZU rehabilitation OR TZ eccentric OR TZ concentric OR TX "heavy slow resistance" OR TX isokinetic OR AB plyometric) AND (ZU tendinopathy OR ZU "tendon injuries" OR ZU tendons OR ZU "shoulder injuries" OR ZU "tennis elbow" OR TX tendin* OR TX tendon* OR ZU bursitis OR AB bursitis OR ZU "shoulder impingement syndrome" OR ZU "posterior tibial tendon dysfunction" OR AB "greater trochanteric pain syndrome")

Open Grey	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Mednar	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
New York Academy Grey Literature Report	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
EThOS	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Google Scholar	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
JBI Evidence Synthesis	Tendinopathy AND exercise
Cochrane Library	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
PEDro	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Epistemonikos	(tendinopathy OR tendon* OR tendin*) AND exercise
CORE	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
Clinicialtrials.gov	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
ISRCTN	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
EU CTR	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise
ANZCTR	Tendinopathy AND exercise Tendin* AND exercise Tendon AND exercise

Search strategy mixed method review

MEDLINE – 29 March 2021

1. MH exercise
2. AB exercis*
3. MM rehabilitation
4. AB rehabilitation
5. MH physical therapy modalities
6. AB "physical therap*"
7. AB physiotherapy*
8. #1 OR … #8 = 503,671
9. MH tendinopathy

10. MH shoulder injuries
11. MH “tendon injuries”
12. TX tendin*
13. TX tendon*
14. MH bursitis
15. AB bursitis
16. MH posterior tibial tendon dysfunction
17. MH shoulder impingement syndrome
18. AB “greater trochanteric pain syndrome”
19. #9 OR ... #18 = 103,386
20. AB fidelity
21. AB acceptability
22. AB adherence
23. AB feasibility
24. AB perception*
25. AB qualitative
26. AB barrier*
27. AB facilitat*
28. AB satisfact*
29. #20 OR ... #28 = 1,736,478
30. #8 AND #19 AND #29 = 1,057
31. #30 (Limiter – Date of publication: 1998–2021) = 925

CINAHL – 29 March 2021

1. MH exercise
2. AB exercis*
3. MM rehabilitation
4. AB rehabilitation
5. AB “physical therapy modalities”
6. AB “physical therap*”
7. AB physiotherapy*
8. #1 OR ... #8 = 224,836
9. MH tendinopathy
10. MH shoulder injuries
11. MH “tendon injuries”
12. TX tendin*
13. TX tendon*
14. MH bursitis
15. AB bursitis
16. MH posterior tibial tendon dysfunction
17. MH shoulder impingement syndrome
18. AB “greater trochanteric pain syndrome”
19. #9 OR ... #18 = 43,916
20. AB fidelity
21. AB acceptability
22. AB adherence
23. AB feasibility
24. AB perception*
25. AB qualitative
26. AB barrier*
27. AB facilitat*
28. AB satisfact*

29. #20 OR … #28 = 504,314
30. #8 AND #19 AND #29 = 621
31. #30 (Limiter – Date of publication: 1998–2021) = 598

AMED – 29 March 2021

1. SU exercise
2. AB exercis*
3. SU rehabilitation
4. AB rehabilitation
5. SU physical therapy modalities
6. AB "physical therap*"
7. AB physiotherapy*
8. #1 OR … #8 = 92,869
9. SU tendinopathy
10. SU shoulder injuries
11. SU "tendon injuries"
12. TX tendin*
13. TX tendon*
14. SU bursitis
15. AB bursitis
16. SU posterior tibial tendon dysfunction
17. SU shoulder impingement syndrome
18. AB "greater trochanteric pain syndrome"
19. #9 OR … #18 = 4,967
20. AB fidelity
21. AB acceptability
22. AB adherence
23. AB feasibility
24. AB perception*
25. AB qualitative
26. AB barrier*
27. AB facilitat*
28. AB satisfact*
29. #20 OR … #28 = 25,279
30. #8 AND #19 AND #28 = 176
31. #29 (with Date Limiter: 1998 – 2021) = 171

EMBase – 29 March 2021

1. SU exercise
2. AB exercis*
3. SU rehabilitation
4. AB rehabilitation
5. AB "physical therapy modalities"
6. AB "physical therap*"
7. AB physiotherapy*
8. #1 OR… #7 = 730,391
9. SU tendinopathy
10. SU "shoulder injuries"
11. SU "tendon injuries"
12. TW tendin*
13. TW tendon*

14. SU bursitis
15. AB bursitis
16. SU posterior tibial tendon dysfunction
17. SU “shoulder impingement syndrome”
18. AB “greater trochanteric pain syndrome”
19. #9 OR … #18 = 100,563
20. AB fidelity
21. AB acceptability
22. AB adherence
23. AB feasibility
24. AB perception*
25. AB qualitative
26. AB barrier*
27. AB facilitat*
28. AB satisfact*
29. #21 OR … #29 = 2,263,117
30. #8 AND #20 AND #30 = 1276
31. #31 (Limiters – Date of Publication: 1998 – 2021) = 114

SPORTDiscus – 29 March 2021

1. SU exercise
2. AB exercis*
3. SU rehabilitation
4. AB rehabilitation
5. AB “physical therapy modalities”
6. AB “physical therap*”
7. AB physiotherapy*
8. #1 OR … #7 = 243,194
9. SU tendinopathy
10. SU shoulder injuries
11. SU “tendon injuries”
12. TX tendin*
13. TX tendon*
14. SU bursitis
15. AB bursitis
16. AB “posterior tibial tendon dysfunction”
17. AB “shoulder impingement syndrome”
18. AB “greater trochanteric pain syndrome”
19. #9 OR … #18 = 46,413
20. AB fidelity
21. AB acceptability
22. AB adherence
23. AB feasibility
24. AB perception*
25. AB qualitative
26. AB barrier*

27. AB facilitat*
28. AB satisfact*
29. #20 OR … #28 = 81,169
30. #8 OR #19 OR #29 = 764
31. #30 (Limiters – Date of Publication: 1998 – 2021) = 723

PEDro – 29 March 2021

tendin* AND exercise = 145 (title and abstract)
tendon* AND exercise = 118 (title and abstract)

Appendix 2

TABLE 33 Table of studies included in scoping review: characteristics and results

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Di Lorenzo, 2006, Italy[208]	RCT – cross-over	Rotator cuff	Strengthening, flexibility	Pain without further specification, disability	NA	Suprascapular nerve blocks can only provide temporary pain relief, and so must be part of a total pain management programme if they are to avoid chronic pain conditions. Combining suprascapular nerve block with standard rehabilitative therapy may improve the outcome of painful rotator cuff tendinopathy.
Güler, 2009, Turkey[209]	RCT	Rotator cuff	Flexibility, strengthening	Pain on loading/activity, ROM, disability	NA	Ketoprofen and lidocaine prilocaine phonophoresis were more effective on pain and ROM than ketoprofen phonophoresis alone in the 3rd month after treatment in patients with SIS.
Abat, 2014, Spain[210]	QE – without control	Patellar	Strengthening	Disability	NA	EPI combined with an eccentric-based rehab programme showed excellent clinical and functional improvements in the patellar tendon compared to eccentric only exercise.
Abat, 2014, Spain[211]	QE – without control	Patellar	Strengthening	Participant/atient rating overall condition, disability	NA	Treatment with the US-guided EPI® technique and eccentric exercises in patellar tendinopathy resulted in a great improvement in knee function and a rapid return to the previous level of activity after few sessions. The procedure has proven to be safe with no recurrences on a long-term basis.
Abat, 2015, Spain[212]	QE – without control	Patellar	Strengthening	Disability	Participation, disability	Treatment with US-guided EPI technique and eccentric exercises resulted in improved knee function and rapid return to previous activity in patellar tendinopathy patients.
Abat, 2016, Spain[213]	RCT	Patellar	Strengthening	Disability	NA	Combining USGET and eccentric exercise resulted in better outcomes for patellar tendinopathy patients than using conventional electro-physiotherapy techniques.
Abdulla, 2015, Canada[214]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	Evidence suggests that supervised and home-based progressive shoulder strengthening and stretching are effective for the management of subacromial impingement syndrome.
Aceituno-Gomez, 2019, Spain[215]	QE – with control (with pre-test)	Rotator cuff	Flexibility, strengthening	Pain without further specification, disability, sensory modality	Medication use	High-intensity laser therapy plus exercise did not give greater improvements in pain and functionality in patients with subacromial syndrome than exercise alone.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Ager, 2019, Canada[215]	Pilot – randomised	Rotator cuff	Flexibility	Disability	Disability, pain on loading/ activity, PFC	Both rehabilitation approaches, grounded in active exercises, were not statistically different from each other, and derived similar benefits over time for a military population. This suggests that a group intervention for a RC tendinopathy has potential to be just as effective as a one-on-one approach for a military population.
Akgun, 2004, Turkey[216]	RCT	Rotator cuff	Strengthening, flexibility	Pain on load-ing/activity, disability, pain over a specified time	NA	Subacromial corticosteroid injections in the acute or subacute phase of SIS provided additional short-term benefit without any complication when used together with NSAIDs and exercise.
Akin, 2013, Turkey[217]	Observational – cohort	Rotator cuff	Flexibility, strengthening	Pain on loading/ activity, pain over a specified time, disability	NA	Ultrasound with exercise and paracetamol had superior benefits for patients compared to exercise and paracetamol alone.
Akkaya, 2017, Turkey[218]	RCT	Rotator cuff	Flexibility	Pain over a specified time, pain on loading/ activity, ROM, disability structure	NA	Weighted and un-weighted solo pendulum exercises achieved significant clinical improvements but showed no differences in ultrasonographic acrohumeral distance measurements between groups.
Akkurt, 2018, Turkey[219]	RCT	Lateral elbow	Flexibility	function capacity, pain on loading/activity, pain over a specified time	NA	Both epicondylitis bandage and hand-wrist resting orthosis are effective treatment options for lateral epicondylitis-induced pain, functional status, muscle strength, and QoL. Neither treatment option was superior to the other.
Aktas, 2007, Turkey[220]	RCT	Rotator cuff	Flexibility	Pain on loading/ activity, disability	NA	Electromagnetic therapy did not provide additional benefit in acute-phase rehabilitation programme f SIS.
Akyol, 2012, Turkey[221]	RCT	Rotator cuff	Flexibility, strengthening	Pain without further specification, ROM, disability, physical function	NA	No statistically significant difference was found between the groups. As it is effective, superficial heat and exercise programme may be a preferable treatment for SIS.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Al Dajah, 2014, Saudi Arabia[222]	RCT	Rotator cuff	Flexibility	Pain without further specification, ROM	NA	A single session of a combination of soft-tissue mobilisation, contract-relax PNF and facilitated abduction and external rotation was effective in reducing glenohumeral pain and improving external rotation and overhead reach.
Al-Abbad, 2013, Saudi Arabia[223]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	There is satisfactory and consistent evidence for the effectiveness of low-energy ESWT in the treatment of chronic insertional and noninsertional Achilles tendinopathies.
Alfredson, 1999, Sweden[224]	QE – without control	Achilles	Strengthening	PFC	NA	Heavy-loaded, eccentric calf-muscle training seems to be a good treatment mode for chronic Achilles tendinosis.
Alfredson, 1998, Sweden[17]	QE – with control (with pre-test)	Achilles	Strengthening	PFC, pain on loading/activity	NA	Our treatment model with heavy-load eccentric calf-muscle training has a very good short-term effect on athletes in their early forties.
Alfredson, 2003, Sweden[225]	QE – without control	Achilles	Strengthening	Pain on loading/activity, structure	NA	Eccentric training was not associated with lowered intratendinous glutamate levels.
Alvarez, 2006, United States[226]	Observational – cohort	Tibialis posterior	Strengthening	PFC, pain on loading/activity, pain over a specified time	NA	Patients with stage I or II PTTD can be effectively treated non-operatively with an orthosis and structured exercises.
Andriolo, 2019, Italy[227]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	Several nonsurgical approaches for the treatment of chronic patellar tendinopathy were documented with overall positive outcomes. Limitations and differences were highlighted.
Apostolos, 2004, NR[228]	Pilot – randomised	Lateral elbow	Strengthening	Pain without further specification, physical function	NA	Active laser therapy in combination with plyometric exercise is more effective than plyometric exercises alone in the treatment of lateral epicondylitis.
Arias-Buria, 2017, Spain[229]	RCT	Rotator cuff	Strengthening	Disability	Pain over a specified time, participant/patient rating overall condition, adverse effects/events	The addition of trigger-point dry needling with an exercise programme was effective for improving disability in subacromial pain syndrome.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Arias-Buria, 2015, Spain[230]	RCT	Rotator cuff	Strengthening	Pain over a specified time	Disability	US-guided percutaneous electrolysis combined with eccentric exercises resulted in better short-term outcomes compared to eccentric exercises alone.
Arnal-Gomez, 2020, Spain[231]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Eccentric exercises performed over 6–12 weeks were effective for AT alone or in combination with vibration, nutritional supplements, soft-tissue treatment, laser, or shockwave.
Askling, 2014, Sweden[232]	RCT	Hamstring	Flexibility, strengthening, aerobic	Participation, adverse effects/ events	NA	A rehabilitation protocol emphasising lengthening type of exercises is more effective than a protocol containing conventional exercises in promoting time to return in Swedish elite sprinters and jumpers.
Aytar, 2015, Turkey[233]	RCT	Rotator cuff	Other, flexibility	Disability, pain on loading/activity, pain over a specified time	ROM, participant/patient rating overall condition	No significant benefit in shoulder function, pain, ROM or satisfaction was observed in scapular mobilisation compared with sham or supervised exercise groups in patients with SAIS.
Bae, 2011, Korea (Republic of)[234]	Control (with pre-test)	Rotator cuff	Other, strengthening	ROM, PFC	NA	The motor control and strengthening programme improved pain, function, strength and ROM.
Bagcier, 2019, Turkey[235]	QE – with control (with pre-test)	Lateral elbow	Flexibility, strengthening	Pain without further specification, physical function	NA	ESWT and DN combination therapy in lateral epicondylitis provide better clinical outcomes than ESWT treatment alone.
Bahr, 2006, Norway[131]	RCT	Patellar	Strengthening	Disability	Participant/ patient rating overall condition, PFC	No added benefit was observed for surgical treatment to eccentric strength training. Eccentric training should be offered for 12 weeks before tenotomy is considered for the treatment of patellar tendinopathy.
Bakkegaard, 2015, Denmark[236]	Observational – cohort	Achilles	Flexibility, strengthening	Physical activity, pain – clinician applied stress/ examination, pain over a specified time, structure	NA	Heterogeneity is a prognostic marker in AT. Tendon thickness, hypoechogenicity and increased Doppler activity can be used as objective outcome parameters for the treatment effect of AT.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Bal, 2009, Turkey[237]	RCT	Rotator cuff	Flexibility, strengthening, other	Pain over a specified time, disability, participant/patient rating overall condition	NA	There was no distinct advantage of low-level laser therapy over exercise alone for shoulder impingement.
Balius, 2016, Spain[238]	RCT	Achilles	Strengthening	Disability	Pain on loading/activity, structure, adverse effects/events	Taking dietary supplements (mucopolisaccharides, type I collagen, vitamin C) seems to be therapeutically useful for management of tendinopathies, providing some additional benefit to physical therapy especially in early stages of the disease, when the tendon does not present severe matrix and vascular changes.
Bang, 2000, United States[239]	RCT	Rotator cuff	Flexibility, strengthening	Disability, pain on loading/activity, PFC	NA	Manual physical therapy applied by experienced physical therapists combined with supervised exercise in a brief clinical trial is better than exercise alone for increasing strength, decreasing pain and improving function in patients with shoulder impingement syndrome.
Barr, 2009, United Kingdom[240]	Systematic reviews/secondary analysis	Lateral elbow	NA	NA	NA	Large effect sizes were demonstrated in favour of corticosteroid injections at short-term follow-up, and physiotherapeutic interventions are effective at intermediate- and long-term follow-up.
Barra-Lopez, 2013, Spain[241]	RCT	Rotator cuff	NR	Pain without further specification	Disability, ROM	Both intervention and placebo groups showed statistically significant improvement.
Barratt, 2017, United Kingdom[242]	Systematic reviews/secondary analysis	Gluteal (including GTPS)	NA	NA	NA	Based on pain, CI demonstrated superior outcomes for up to 3 months compared with home training, radial shockwave therapy (RSWT) and usual care. RSWT and home training had limited evidence.
Barratt, 2018, United Kingdom[243]	Other	Lateral elbow	Strengthening	NA	NA	Insufficient loading could have resulted in reduced treatment effectiveness whereas exercising into pain resulted in a higher number of responders.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Barrett, 2018, United Kingdom[154]	Qualitative	Rotator cuff	Flexibility, strengthening, other	NA	NA	Exercise class was positively evaluated by all participants – seen as a conducive environment to develop relationships, friendships, humour and fun, gaining mastery of their exercises, and encourage the transition toward self-management. It was also evaluated as the preferred mode of physiotherapy delivery for those who had previous one-to-one physiotherapy experience.
Basas, 2018, Spain[244]	Observational – cohort	Patellar	Strengthening, flexibility	Pain on loading/activity	NA	In a small group of high-level jumping athletes with chronic painful JK, a strength protocol combined with electrical stimulation showed promising clinical results with significant pain reduction during tendon loading activity.
Baskurt, 2003, Turkey[245]	QE – without control	Lateral elbow	Flexibility, strengthening	Pain on loading/activity, pain over a specified time, physical function	NA	Iontophoresis and phonophoresis of naproxen are equally effective electro-therapy methods in the treatment of lateral epicondylitis.
Baskurt, 2011, Turkey[246]	QE – without control	Rotator cuff	Flexibility, strengthening, other	Pain without further specification, ROM, physical function	NA	Scapular stabilisation combine with stretching and strengthening exercises can be more effective in the short term for SIS.
Bastia, 2019, Italy[247]	Systematic reviews/secondary analysis	Other – adductor related groin pain	NA	NA	NA	Surgery allows shorter return to sport time than conservative treatment but heterogeneity of available studies and lack of dedicated RCTs make it impossible to draw definitive conclusions.
Bateman, 2014, United Kingdom[248]	Pilot – feasibility	Rotator cuff	Strengthening	Disability, pain without further specification, other	NA	Although the results of this small study did not show statistically significant differences in outcome measures, two patients in the eccentric exercise group did improve sufficiently such that they cancelled their planned arthroscopic shoulder surgery.
Baumer, 2016, United States[249]	RCT	Rotator cuff	Strengthening, other, flexibility	PFC, pain over a specified time,	NA	Physical therapy demonstrated a positive impact on clinical measures (VAS, WORC, ROM) in symptomatic individuals but not observed in the asymptomatic group.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Bek, 2012, Turkey[250]	QE – without control	Posterior tibial tendon	Strengthening	Pain without further specification, disability, PFC	NA	While supervised, patient-selective programme ay provide better improvement in tibialis posterior strength than home-based rehabilitation, both programmes seem to be effective in relieving pain and improving functional outcome in patients with Grade 1–3 PTTD.
Bell, 2013, New Zealand[251]	RCT	Achilles	Strengthening	Disability	Participant/patient rating overall condition, participation	The addition of two peritendinous autologous blood injections administered one month apart to a standardised eccentric training programme provides no added benefit in the treatment of mid-portion AT.
Bennell, 2010, Australia[188]	RCT	Rotator cuff	Other, strengthening, flexibility	Pain on loading/activity, participant/patient rating overall condition	PFC, participation, QoL, adverse effects/events	Immediately after the intervention, active treatment produced similar benefits on shoulder pain and function compared with a realistic placebo. However, significant improvements in pain and function were found in favour of active treatment at follow-up.
Bernhardsson, 2011, Sweden[252]	QE – without control	Rotator cuff	Other, strengthening, Flexmibility	Pain without further specification, function	Disability, Participant/patient rating overall condition	A 12-week eccentric strengthening programme targeting the rotator cuff and incorporating scapular control and correct movement pattern can be effective in decreasing pain and increasing function in patients with subacromial impingement syndrome.
Beyer, 2015, Denmark[18]	RCT	Achilles	Strengthening	Disability	Pain on loading/activity, participation, participant/patient rating overall	Both traditional eccentric exercise and HSR yield positive, equally good and lasting clinical results in patients with AT. HSR is associated with greater patient satisfaction after 12 weeks but not after 52 weeks.
Bianco, 2019, United States[253]	Observational – case series/reports	Patellar	Strengthening	applied stress/examination, disability, function, ROM, physical function	NA	Improvements in outcome measures were observed even in a short time.
Bisset, 2006, Australia[254]	RCT	Lateral elbow	Strengthening, flexibility	function capacity, participant/patient rating overall condition, clinical	Pain over a specified time, disability	Physiotherapy combining elbow manipulation and exercise has a superior benefit to wait-and-see and to corticosteroid injections in the short term (6 weeks), providing a reasonable alternative to injections in the mid to long term.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Bisset, 2005, Australia[255]	Reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Few conclusions can be drawn from the limited number of studies with contradicting findings.
Bisset, 2009, Australia[256]	RCT	Lateral elbow	NR	PFC	NA	Sensorimotor deficits were not improved by either intervention – physiotherapy, injection, and wait-and-see.
Bjordal, 2008, Norway[257]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	In contradiction to previous reviews, this review identifies optimal doses at which low-level laser therapy offers short-term pain relief and less disability in LE, both alone and in conjunction with exercise.
Bjornsson Hallgren, 2017, Sweden[258]	RCT	Rotator cuff	Strengthening, flexibility	Disability, pain over a specified time, pain on loading/ activity, QoL, other	NA	More patients in the specific exercise group managed to avoid surgery compared to the unspecific exercise group at 5-year follow-up supporting its prescription as an initial treatment for patients with subacromial pain.
Blackwood, 2012, United Kingdom[259]	Pilot – randomised	Patellar	Strengthening, other	Pain without further specification, disability	NA	This study demonstrated that the design was feasible, with both groups significantly improving pain/function but with significantly greater improvement in the group that received transverse friction massage prior to exercise.
Blume, 2015, United States[260]	RCT	Rotator cuff	Strengthening	Pain without further specification, disability, ROM, physical function	NA	Both submaximal eccentric and concentric PREs resulted in improved function, AROM and strength in patients with SAIS. No difference found between the two exercise modes.
Boesen, 2017, Denmark[162]	RCT	Achilles	Strengthening, aerobic	Disability	Pain on loading/activity, structure, PFC, participant/ patient rating overall condition, participation	Treatment with HVI or PRP in combination with eccentric training in chronic AT seems more effective in reducing pain, improving activity level, and reducing tendon thickness and intratendinous vascularity than eccentric training alone. HVI may be more effective in improving outcomes of chronic AT than PRP in the short term.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Boesen, 2019, Denmark[163]	RCT	Achilles	Strengthening	Disability	Pain over a specified time, structure, participant/patient rating overall condition	HVI with or without corticosteroid in combination with eccentric training seems effective in AT. HVI with corticosteroid showed a better short-term improvement than HVI without corticosteroid, indicating a short-term effect of corticosteroid in the treatment of AT.
Bostrom, 2019, Norway[261]	RCT	Lateral elbow	Strengthening	Other	Pain over a specified time, disability, Medication use, participation, participant/patient rating	The acceptable level of compliance observed in the treatment groups confirms the feasibility of a larger-scale trial with minor adjustments to improve attrition rates. While both treatments were effective in significantly reducing pain, exercise alone provided inferior results.
Boudreau, 2019, Canada[262]	RCT	Rotator cuff	Strengthening	Disability	Disability, pain on loading/activity, structure	No additional benefit was found to adding coactivation to regular rotator cuff strengthening exercises at 6 weeks.
Bowring, 2010, United Kingdom[263]	Reviews/secondary analysis	Tibialis posterior	NA	NA	NA	Further research required with the limited and poor-quality evidence in the treatment of TPTD.
Boyles, 2009, United States[264]	Observational – cohort	Rotator cuff	Flexibility	Pain on loading/activity, pain over a specified time, disability, participant/patient rating overall condition	NA	Manipulation demonstrated short-term relief of pain and function.
Branson, 2017, Australia[265]	RCT	Lateral elbow	Strengthening	Participant/patient rating overall condition	Pain on loading/activity, disability, structure	Corticosteroid injection demonstrated superior outcomes on the Patient Rated Tennis Elbow Evaluation than other intervention measures; however, its long-term efficacy and recurrence rate was unclear.
Braun, 2010, United Kingdom[266]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	MT and exercise seem effective for subacute and chronic shoulder impingement with short- to medium-term effectiveness, but varying methodological quality and risk of bias in reviews and trials warrant caution in the interpretation of the results.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Braun, 2013, United Kingdom[267]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Nine RCTs were included and synthesised narratively. This review update provides some further evidence supporting the effectiveness of MT and exercises for shoulder impingement, but methodological deficits/risk of bias warrant cautious interpretation.
Brown, 2006, Australia[268]	RCT	Achilles	Strengthening	Disability, adverse effects/ events	NA	Using a functional grade of severity and a functional outcome measure in a double-blind placebo-controlled trial we failed to confirm the benefit of aprotinin in tendinopathy.
Brox, 1999, Norway[269]	RCT	Rotator cuff	Flexibility, other	Disability	Pain on loading/ activity, pain over a specified time, function, psychological factors, medication use, PFC	At 2.5 years follow-up, both arthroscopic surgery and supervised exercises are better treatments than placebo with no significant difference between the 2 active treatments.
Bury, 2016, United Kingdom[270]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	SFA for RCSP confers benefit (pain and functional improvement) over generalised approaches up to six weeks but this benefit is not apparent by 3 months. Early changes in pain are not clinically significant. With regard to scapula position/ movement, the evidence is conflicting.
Cacchio, 2011, Italy[271]	RCT	Hamstring	Aerobic, Strengthening	Pain without further specification, disability	specified time, participant/ patient rating overall condition	SWT is a more effective treatment to conservative treatment for proximal hamstring tendinopathy.
Cairns, 2018, United Kingdom[272]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	There is a lack of studies assessing the effectiveness of interventions for patellar tendon-related pain in children and adolescents. Based on the available studies, there is weak evidence to support the use of dextrose injection with local anaesthetic and no evidence to support the use of specific types of exercises.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Calis, 2011, Turkey[273]	RCT	Rotator cuff	Flexibility, strengthening	Pain on loading/activity, pain over a specified time, ROM, disability	NA	Ultrasound and laser treatments were not superior to each other in the treatment of SIS
Campbell, 2019, United Kingdom[151]	Qualitative	Tibialis posterior	NA	NA	NA	Treatment burden is an important factor in the management of PTTD
Canbulat, 2013, Turkey[274]	RCT	Rotator cuff	Flexibility, strengthening, other	Disability	NA	The addition of core stabilisation exercises to standard comprehensive physiotherapy applied in the rehabilitation of patients with subacromial impingement syndrome significantly improves treatment effectiveness.
Cannell, 2001, Canada[275]	RCT	Patellar	Aerobic, strengthening	Pain without further specification, PFC	NA	Progressive drop squats and leg extension/curl exercises can reduce the pain of jumper's knee in a 12-week period and resulted in a high proportion of patients returning to sport.
Carlisi, 2018, Italy[276]	Pilot – non-randomised	Rotator cuff	Strengthening, flexibility			F-ESWT is equally effective as eccentric exercises using elastic resistance in reducing shoulder pain.
Celik, 2019, Turkey[277]	RCT	Lateral elbow	Flexibility, strengthening	Pain onloading/activity, QoL, participant/patient rating overall condition,	NA	Both photo-biomodulation and ESWT are useful and can be used in the treatment of LE based on improvements in handgrip strength. Improvements for elbow extension and shoulder flexion strength and VAS were mainly observed in the photo-biomodulation group.
Celik, 2009, Turkey[278]	Control (with pre-test)	Rotator cuff	Flexibility, strengthening	NA	NA	Despite initial short-term pain relief from injection, both groups demonstrated improvements at 3 and 6 weeks.
Celik, 2009, Turkey[279]	QE – without control	Rotator cuff	Flexibility, strengthening	Pain without further specification, psychological factors	NA	Both groups had significant improvements in pain and disability measures; however, exercise programme within pain-free ROM showed additional improvements in VAS and face scores in SIS.
Cerdan Fabregat, 2019, Spain[280]	Observational – case series/reports	Achilles	Strengthening	Pain without further specification, disability, structure	NA	A combined programme of PNE with eccentric exercises was effective at improving outcomes for chronic tendinopathy of the Achilles tendon body.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Challoumas, 2019, United Kingdom[281]	Systematic reviews/ secondary analysis	Rotator cuff, lateral elbow, patellar, Achilles	NA	NA	NA	Surgery is not superior to exercise and therefore recommend only after a long course (at least 12 months) of evidence-based loading exercise has failed.
Chan, 2000, Hong Kong, China (SAR)[282]	Pilot – feasibility	Lateral elbow	Flexibility, strengthening	Pain without further specification, PFC, function, participant/ patient	NA	The programme improved patients' work capacities and satisfaction while maintaining pain symptoms at a low level.
Chary-Valckenaere, 2018, France[283]	RCT	Rotator cuff	Flexibility	Disability	QoL	Spa therapy consisting of mineral water baths and mud applications together with supervised self-mobilisation in a thermal pool provided significant benefit in pain, function and QoL in patients with chronic shoulder pain compared to usual care.
Chen, 2017, Taiwan[284]	QE – without control	Other – subscapularis tendinopathy	Flexibility, strengthening	Pain without further specification, ROM, physical function	NA	Combined treatment (eccentric, ESWT, and conventional) improved patients with noncalcific subscapular tendinosis.
Chen, 2020, Singapore[285]	Reviews/ secondary analysis	Lateral elbow	NA	NA	NA	There is evidence that eccentric exercise can reduce pain and improve function in lateral elbow tendinopathy.
Cheng, 2007, China[286]	RCT	Rotator cuff	Strengthening	Disability, participation	NA	Workplace-based rehabilitation programme appeared to be more effective in facilitating the return to work process of the injured worker following intervention.
Cherry, 2012, United States[287]	RCT	Lateral elbow	Flexibility	PFC, pain on loading/activity, disability	NA	Exercise and cryotherapy used in isolation or in combination reduce the symptoms of lateral epicondylitis. Cryo-MAX® was preferred over conventional cold packs but it did not have any additional therapeutic benefit.
Chester, 2008, United Kingdom[288]	Pilot – randomised	Achilles	Strengthening	Pain on loading/activity, disability, QoL	NA	Both interventions were equally effective and acceptable to patients with no adverse effects.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Cho, 2017, Korea (Republic of)[289]	QE – with control (with pre-test)	Patellar	Strengthening, flexibility, aerobic	Pain without further specification, disability, PFC, pain	NA	A rehabilitation exercise programme was more effective at improving pain, strength and function in patellar tendinopathy than injection therapy alone.
Chung, 2004, Canada[290]	RCT	Lateral elbow	Flexibility	Pain over a specified time, pain on loading/activity	QoL, PFC	ESWT combined with stretching were no more effective than stretching alone in the treatment of lateral epicondylitis.
Chung, 2005, Canada[291]	RCT	Lateral elbow	Flexibility	Pain over a specified time	PFC, QoL	ESWT does not appear to be an effective treatment for individuals with previously untreated lateral epicondylitis.
Cioni, 2017, Italy[292]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	The reviewed literature confirms the effectiveness of exercise for tendinopathies; however, it was not found to be superior to other existing methods.
Citaker, 2005, Turkey[293]	RCT	Rotator cuff	Flexibility, strengthening	Pain without further specification, ROM	NA	Mobilisation and PNF methods were both effective, but mobilisation is a painless technique and therefore was better tolerated than PNF.
Clarke, 2010, United Kingdom[294]	Observational – cohort	Lateral elbow	Flexibility, strengthening	Disability, structure	NA	This study shows that the presence of an LCL tear and the size of the largest intrasubstance tears are predictors of poor outcome. No correlation with tendon thickness or neovascularity was seen.
Clarke, 2011, United Kingdom[295]	RCT	Patellar	Aerobic, flexibility, strengthening	Disability	Structure	Ultrasound-guided injection of autologous skin-derived tendon-like cells can be safely used in the short term alongside exercise to treat patellar tendinopathy, with faster response of treatment and significantly greater improvement in pain and function than with plasma alone.
Cleland, 2004, United States[296]	Observational – cohort	Lateral elbow	Strengthening, flexibility	Function, other	NA	Local management plus cervical MT may be more efficient for managing patients with LE.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Clifford, 2019, United Kingdom[179]	Pilot – randomised	Gluteal (including GTPS)	Strengthening	Disability	Pain without further specification, participant/patient rating overall condition, psychological factors, disability, QoL, physical activity	Isometric and isotonic exercise programmes appear to be effective for individuals with GTPS.
Coghlan, 2008, Australia[297]	Reviews/secondary analysis	Rotator cuff	NA	NA	NA	Three trials reported no difference between surgery and physiotherapy alone or with education.
Conroy, 1998, United States[298]	QE – with control (with pre-test)	Rotator cuff	Flexibility, strengthening	Loading/activity, pain over a specified time, clinical examination findings, ROM, function	NA	Both groups improve mobility and function in shoulder impingement syndrome but only joint mobilisation relieves pain over a 24-hour period.
Cook, 2014, United States[172]	RCT	Rotator cuff	Strengthening, flexibility	Disability	Pain without further specification, participant/patient rating overall condition, other	A standardised cervical mobilisation on a tender cervical segmental level combined with a comprehensive shoulder treatment protocol did not result in any added improvement on pain and DASH scores in the treatment of SIS.
Coombes, 2016, Australia[299]	RCT	Lateral elbow	NA	QoL	NA	Findings are in agreement with a large body of evidence that does not support corticosteroid injection as a first-line intervention for lateral epicondyitits. Physiotherapy is less costly and appears to provide greater QoL outcomes over the long term, supporting its use as an intervention.
Coombes, 2013, Australia[176]	RCT	Lateral elbow	Other, strengthening	Participant/patient rating overall condition, other	Patient rating overall condition, pain over a specified time, disability, QoL, medication	Multimodal physiotherapy provided no beneficial long-term effect on complete recovery, recurrence, pain, disability or QoL. However, in the absence of a corticosteroid injection, physiotherapy may provide a short-term benefit across all outcomes. Corticosteroid injections generally result in a poorer clinical outcome.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Crawshaw, 2010, United Kingdom[300]	RCT	Rotator cuff	Flexibility, strengthening, other	Disability	Use, participant/patient rating overall condition, adverse effects/events	At 12 weeks, steroid injection combined with exercise showed similar effectiveness to exercise alone. However, earlier improvement in pain and function was observed with corticosteroid injection combined with exercise and MT.
Crill, 2014, United States[301]	Observational – case series/reports	Achilles	Strengthening	Structure	Function	Medial gastrocnemius muscle fascicles increase in length as a result of training, which could lead to a rightward shift in the length–tension curve and possibly prevent future muscular injuries.
Croisier, 2001, Belgium[302]	QE – without control	Achilles, lateral elbow, patellar	Strengthening	Specified time, PFC, participation, structure	NA	Eccentric training is effective in reducing pain, improving strength, return to activities, and tendon recovery.
Croisier, 2002, Belgium[303]	QE – without control	Achilles, patellar, other – epicondylian	Strengthening	Pain without further specification, PFC, disability	NA	Eccentric exercise appears to be an effective treatment modality for various chronic tendinopathies.
Croisier, 2007, Belgium[304]	QE – with control (with pre-test)	Lateral elbow	Strengthening, flexibility	Pain on loading/activity, PFC, disability, structure	NA	Isokinetic adapted eccentric training significantly reduced pain intensity, improved tendon structure, strength, disability, and participation compared to the non- strengthening control group in the management of chronic lateral epicondylar tendinopathy.
Cullinane, 2014, New Zealand[305]	Systematic reviews/secondary analysis	Lateral elbow	NA	NA	NA	There is support for the inclusion of eccentric exercise as part of a multimodal therapy programme for improved outcomes in patients with lateral epicondylitis.
Cumpston, 2009, Australia[306]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	There is insufficient evidence to assess if glyceryl trinitrate patches are effective in treating rotator cuff disease. Three small studies, one at moderate risk of bias and two at high risk of bias, assessed the effectiveness of glyceryl trinitrate but each report ed different treatment regimens and different outcome measures. They also included participants with differing duration of symptoms (acute/chronic). Heterogeneity limited the pooled analysis of the available data.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Dale, 2016, United States[173]	Pilot – randomised	Lateral elbow	Other, strengthening	Pain over a specified time, physical function	NA	Compared to a standard intervention the pilates-based intervention only resulted in greater improvement in the PRTEE outcome.
Dan, 2019, Australia[307]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	Uncertainty remains over the benefits of surgery over therapeutic interventions such as eccentric exercises or sclerosing injections for treating patellar tendinopathy.
de Jonge, 2011, Netherlands[60]	RCT	Achilles	Flexibility, strengthening	Disability	Participant/ patient rating overall condition, participation	This RCT showed no clinical (VISA-A) and ultrasonographic superiority of PRP injection over a placebo injection in chronic AT at 1 year combined with an eccentric training programme.
de Jonge, 2015, Netherlands[308]	Observational – cohort	Achilles	strengthening, flexibility	Disability, structure	NA	While tendinous structures appear to improve following a conservative approach, there were no differences in VISA-A scores between groups.
de Jonge, 2010, Netherlands[309]	RCT	Achilles	Strengthening	Patient rating overall condi-tion, structure, disability	NA	Eccentric exercises with or without a night splint improved functional outcome at one year follow-up. There was no added benefit to clinical outcome with the addition of night splint.
de la Fuente, 2019, Spain[310]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	Active exercise in general, and particularly eccentric exercise, is the most effective treatment for patellar tendinopathy. Ultrasound-guided electrolysis, hyperthermia and taping are also useful.
De Mey, 2012, Belgium[311]	QE – without control	Rotator cuff	Other	PFC	NA	Six-week scapular exercise improved pain, symptoms and activation levels in overhead athletes with mild SIS.
de Miguel Valtierra, 2018, Spain[312]	RCT	Rotator cuff	Other, strengthening	Disability	Pain over a specified time, disability, sensory modality specific pain, participant/ patient rating overall condition	Inclusion of US-guided percutaneous electrolysis in a treatment approach including MT and exercise resulted in no significant differences in shoulder-related disability and pressure pain sensitivity in subjects with subacromial p ain syndrome.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
De Reu, 2018, Belgium[313]	RCT	Rotator cuff	Strengthening	Modality-specific pain, structure	NA	There were no significant differences between groups to determine which, if any, exercise programme was superior.
de Vos, 2010, Netherlands[314]	RCT	Achilles	Strengthening, flexibility	Disability	Participant/patient rating overall condition, participation	Among patients with chronic midportion AT treated with an eccentric exercise programme, a PRP injection compared with a saline injection did not result in greater improvement in pain and activity.
de Vos, 2012, Netherlands[315]	Observational – cohort	Achilles	Strengthening	Disability, structure	NA	While VISA-A score improved after 24 weeks, there is no short-term increase in organised tendon structure after eccentric exercise. Tendon structure is unrelated to clinical severity of symptoms.
de Vos, 2007, Netherlands[59]	RCT	Achilles	Strengthening	Disability, participant/patient rating overall condition	NA	A night splint has no added benefit to eccentric exercises in the treatment of chronic midportion AT. There was no significant difference between the two groups in VISA-A score and patient satisfaction.
de Vos, 2007, Netherlands[316]	Observational – cohort	Achilles	Strengthening	Disability, pain on loading/activity	NA	There were no correlations between neovascularisation and VIS-A or VAS scores at baseline. Therefore, performing ultrasound to characterise tissues at baseline has no prognostic value.
de Vos, 2011, Netherlands[317]	RCT	Achilles	Flexibility, strengthening	Structure	Other, PFC	No significant differences in tendon structure within a 24-week time period were observed when PRP injections were used with exercise compared to placebo.
Deans, 2012, United Kingdom[318]	Observational – case series/reports	Achilles	Strengthening	Disability	NA	Autologous-conditioned plasma can provide a potential treatment solution for chronic AT.
Dejaco, 2017, Netherlands[319]	RCT	Rotator cuff	Strengthening, flexibility	Disability	Pain on loading/activity, ROM, PFC	12-week-isolated eccentric training programme of the RC is beneficial for shoulder function and pain after 26 weeks in patients with RC tendinopathy. However, it is no more beneficial than a conventional exercise programme for the RC and scapular muscles.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Desjardins-Charbonneau, 2015, Canada[319]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	For patients with RC tendinopathy, based on low- to moderate-quality evidence, MT may decrease pain; however, it is unclear whether it can improve function.
Desjardins-Charbonneau, 2015, Canada[320]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NR	Kinesiology taping significantly improved pain-free ROM; however, there is insufficient evidence on the effectiveness of kinesiology taping or non-elastic taping used alone or in conjunction with other interventions in patients with RC tendinopathy.
Desmeules, 2004, Canada[321]	QE – with control (with pre-test)	Rotator cuff	Flexibility, other, Stmrengthening	Disability	ROM, PFC, pain on loading/ activity	A reduction of acromio-humeral distance narrowing is strongly associated with functional improvement following rehabilitation. Ultrasound measurement of acromio-humeral distance might help identify SIS patients who will benefit from rehabilitation.
Desmeules, 2003, Canada[322]	Reviews/ secondary analysis	Rotator cuff	NA	NA	NA	There is limited evidence to support the efficacy of thera-peutic exercise and MT to treat impingement syndrome.
Desmeules, 2015, Canada[323]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	US therapy is not superior to placebo and is of no added benefit when used in conjunction with exercise in terms of pain reduction and self-reported function based on low-level evidence.
Desmeules, 2016, Canada[324]	Systematic reviews/ secondary analysis	Rotator cuff, other – bicipital, subdeltoid bursitis	NA	NA	NA	Due to the limited number of studies (six studies) and the overall high risk of bias of the studies included in this review, no conclusions can be drawn on the efficacy of TENS for the treatment of rotator cuff tendinopathy.
Desmeules, 2016, Canada[325]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Three RCTs of moderate methodological quality provided low- to moderate-grade evidence that therapeutic exercises provided in a clinical setting are an effective modality to treat workers suffering from rotator cuff tendinopathy and to promote return-to-work.
Devereaux, 2016, Canada[326]	RCT	Rotator cuff	Flexibility, strengthening, other	applied stress/ examination, pain without further specification,	NA	The improvements in pain and function observed with an NSAID or precut kinesiology tape as adjuvant treatments were no greater than with rehabilitation exercise alone.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Diaz, 2016, Spain[327]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	Eccentric exercises are effective in treating patellar tendinopathy; however, no evidence has shown that they are better than other currently applied treatments (such as shockwaves, stretches, night splints, etc.). On the other hand, no specific protocol for applying these exercises has been established.
Dickens, 2005, United Kingdom[328]	QE – with control (no pre-test)	Rotator cuff	Other, strengthening	Disability	NA	All patients in this study improved their Constant score with physiotherapy.
Dilek, 2016, Turkey[329]	RCT	Rotator cuff	Flexibility, strengthening, other	Clinical examination findings	specified time, pain on loading/ activity, pain without further specification, disability, ROM, physical function	Although proprioceptive exercises may provide better proprioceptive acuity, no additional positive effect on other clinical parameters was observed.
Dimitrios, 2012, Greece[330]	QE – with control (with pre-test)	Patellar	Strengthening, flexibility	Disability, drop-out or discontinued treatment	NA	Eccentric training and static stretching exercises are superior to eccentric training alone to reduce pain and improve function in patients with patellar tendinopathy at the end of the treatment and at follow-up.
Dimitrios, 2013, Cyprus[331]	QE – with control (with pre-test)	Lateral elbow	Strengthening, flexibility	Pain over a specified time, function, PFC, drop out or discontinued	NA	A specific supervised exercise programme is superior to a specific HEP in reducing pain and improving function in patients with LET at the end of the treatment and at the 3-month follow-up.
Dingemanse, 2014, Netherlands[332]	Systematic reviews/ secondary analysis	Medial elbow, golfer's elbow, lateral elbow	NA	NA	NA	Potential effectiveness of ultrasound for the management of LE was found on mid-term follow-up. Moderate evidence was also found in favour of laser therapy over plyometric exercises on short-term follow-up. For all other modalities only limited, conflicting or evidence of no difference in effect was found.
Dogan, 2010, Turkey[333]	RCT	Rotator cuff	Flexibility	Pain on further specification, ROM,	NA	Laser therapy was no more effective than placebo laser.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Doiron-Cadrin, 2020, Canada[334]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Only three CPGs were of high quality, while six were low. All CPGs recommended active treatment modalities, such as an exercise programme in the management of rotator cuff disorders. Acetaminophen or nonsteroidal anti-inflammatory drug prescriptions and corticosteroid injections were presented as modalities that may be recommended to decrease pain. Recommendations related to medical imagery and surgical opinion varied among the guidelines. The most commonly recommended return-to-work strategies included intervening early, use of a multidisciplinary approach, and adaptation of work organisation.
Dorrestijn, 2009, Netherlands[335]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NR	No high-quality RCTs were available. According to the best-evidence synthesis, there is no evidence for differences in pain and shoulder function between conservatively and surgically treated patients with SIS.
Dragoo, 2014, United States[336]	RCT	Patellar	Strengthening	Disability	Disability, pain without further specification, QoL	A regimen of standardised eccentric exercise and ultrasound-guided leukocyte-rich PRP injection with DN accelerates the recovery from patellar tendinopathy relative to exercise and ultrasound-guided DN alone, but the apparent benefit of PRP is short-term.
Drew, 2014, United Kingdom[337]	Systematic reviews/ secondary analysis	Rotator cuff, tibialis posterior, lateral elbow, medial elbow/ golfer's	NA	NA	NA	The literature does not support observable structural change as an explanation for the response of therapeutic exercise, except for some support from heavy-slow resistance training.
Dumont, 2006, Canada[338]	Observational – case series/ reports	Patellar	strengthening, flexibility	Pain on loading/ activity, function	PFC	The eccentric exercise programme showed mixed clinical benefits for four patients with patellar tendinopathy but none of the patients achieved full recovery within the suggested six-week treatment period.
Dupuis, 2018, Canada[339]	RCT	Rotator cuff	Strengthening, flexibility	Disability	Pain over a specified time, structure, physical function	Both groups showed statistically significant improvements on symptoms and function at 2 weeks and 6 weeks but there was no difference between the short-term effect of cryotherapy and a gradual reloading exercise programme.

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TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Efstratiadis, 2016, Greece[340]	Reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Exercise equally effective as surgery for pain and function.
Eken Gedik, 2016, Turkey[341]	QE – with control (with pre-test)	Lateral elbow	Flexibility, strengthening	modality specific pain, PFC, disability, participant/ patient	NA	Autologous blood injection is effective in patients with LE and this effectiveness has continued at 6 months. Therefore, autologous blood injection, which has relatively fewer side effects, might be included among long-term treatment options for LE.
Ellegaard, 2016, Denmark[342]	RCT	Rotator cuff	Strengthening, other	Pain over a specified time, pain on loading/ activity	Pain on loading/ activity, pain over a specified time, clinical examination findings, structure, disability, PFC	10 weeks of unilateral exercise as an adjunct to subacromial steroid injections did not im prove the primary outcome of shoulder pain due to SAPS and enlarged subacromial bursa, compared to exercise.
Elsodany, 2018, Saudi Arabia[343]	RCT	Rotator cuff	Flexibility, other, strengthening	Pain without further speci-fication, ROM, disability	NA	Pulsed Nd:YAG laser combined with an exercise programme seems to be more effective in the treatment of patients with rotator cuff tendinopathy than a sham laser with exercises.
Engebretsen, 2009, Norway[344]	RCT	Rotator cuff	Other, strengthening	Disability	Loading/activity, pain over a speci-fied time, function, ROM,	Supervised exercises are superior to ESWT in terms of shoulder pain, disability and some work-related outcomes.
Engebretsen, 2011, Norway[345]	RCT	Rotator cuff	Other, strengthening	Disability	Loading/activity, pain over a speci-fied time, function, participation, medication use, psychological	Both radial ESWT and the supervised exercise regime devised by Bohmer (1998) provided similar benefits in pain and function-related outcomes. However, exercise may be superior for work-related outcomes.
Entrellardat Tortillo, 2019, Spain[346]	QE – without control	Patellar	Strengthening	Disability, pain without further specification, structure	NA	Percutaneous needle electrolysis combined with eccentric overload exercise represent a treatment which may be effective for most cases of chronic patellar tendinopathy.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Eraslan, 2018, Turkey[347]	RCT	Lateral elbow	Strengthening, flexibility	Loading/activity pain over a specified time, PFC	NA	Kinesiotaping effectively decreased pain intensity, recovered grip strength, and improved function in patients with lateral epicondylitis undergoing rehabilitation.
Eraslan, 2015, Turkey[348]	RCT	Lateral elbow	Flexibility, strengthening	Pain over a specified time, pain on loading/activity, physical function	NA	Kinesiotape is effective in reducing pain associated with lateral epicondylitis, recovering grip strength and may be considered an effective method of treatment.
Evangelos, 2018, Cyprus[349]	Pilot – non-randomised	Patellar	Strengthening, flexibility	Disability, drop-out or discontinued treatment	NA	Eccentric and static stretching exercise programme combined with HILT is an effective treatment approach for patients with chronic PT.
Everhart, 2017, United States[350]	Systematic reviews/secondary analysis	Patellar	NA	NA	NA	A total of 15 studies were included. Reporting quality was high, and there was no systematic evidence of reporting bias. Initial treatment of PT can consist of eccentric squat-based therapy, shockwave, or PRP as monotherapy or an adjunct to accelerate recovery. Surgery or shockwave can be considered for patients who fail to improve after 6 months of conservative treatment. Corticosteroid therapy should not be used in the treatment of PT.
Faber, 2006, Netherlands[351]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	19 articles were included in this review. For functional limitations, there is strong evidence that ESWT is not effective, moderate evidence that exercise combined with MT is more effective than exercise alone, that ultrasound is not effective, and that open and arthroscopic acromioplasty are equally effective in the long ter m. Most studies used ROM and pain as outcome measures whereas functional limitations were less often used.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Fahlström, 2003, Sweden[352]	QE – with control (with pre-test)	Achilles	Strengthening	Pain on loading/activity, participation, participant/patient rating overall	NA	Treatment with eccentric calf-muscle training produced good clinical results in patients with chronic painful mid-portion Achilles tendinosis, but not in patients with chronic insertional Achilles tendon pain.
Farfaras, 2016, Sweden[353]	RCT	Rotator cuff	Other, flexibility, strengthening	Disability, QoL	NA	Outcomes did not demonstrate significant differences between the three groups 2–3 years after intervention.
Faria, 2006, Portugal[354]	QE – with control (with pre-test)	Rotator cuff	Flexibility, strengthening	Pain without further specification	NA	All treatment groups effectively reduced pain. However, it is not clear whether the significant differences observed between groups could be due to factors other than the primary intervention in the absence of randomisation.
Farnqvist, 2020, Sweden[355]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	There was strong evidence that Achilles tendon thickness does not decrease in parallel with improved clinical outcomes. It remains unknown whether a longer time to follow-up is more important than the intervention for a change in tendon thickness.
Fournier Belley, 2018, Canada[164]	RCT	Rotator cuff	Other, flexibility, strengthening	Disability	Structure, PFC	Results do not demonstrate any improved treatment outcomes from the addition of a tDCS during a rehabilitation programme for individuals with rotator cuff tendinopathy.
French, 2019, Ireland[356]	Survey	Gluteal (including GTPS)	NA	NA	NA	This international survey found that education used in conjunction with exercise for the management of GTPS is in line with current evidence. Some clinicians use adjunct treatments without clear rationale or supporting evidence.
Frizziero, 2014, Italy[357]	Systematic reviews/ secondary analysis	Patellar, rotator cuff, Lateral elbow, other – adductor-related groin	NA	NA	NA	Evidence for eccentric exercise in Achilles and patellar tendinopathies may be useful in other tendinopathies. Review highlights large variability and lack of high-quality evidence.
Frizziero, 2016, Italy[358]	Systematic reviews/ secondary analysis	Greater trochanteric, calcific, iliopsoas, adductor, proximal hamstring	NA	NA	NA	Conservative treatment is effective in the treatment of hip tendinopathies. Exercise should be considered first line of treatment.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Frohm, 2007, Sweden[359]	RCT	Patellar	Aerobic, strengthening, flexibility	Disability	PFC, pain on loading/activity	In patients with patellar tendinopathy pain, two-legged eccentric overload training twice per week, using the new device (Bromsman), was as efficient and safe as the present standard daily eccentric one-legged rehabilitation-training regimen using a decline board.
Furia, 2016, United States[360]	Observational – case control	Other – distal biceps	Strengthening	Pain without further specification, disability	NA	Both rESWT and the control treatment effectively improve pain and disability for distal biceps tendinopathy.
Ganderton, 2018, Australia[189]	RCT	Gluteal (including GTPS)	Strengthening, flexibility	Disability	Disability, participant/patient rating overall condition, pain without further specification	Lack of treatment effect was found with the addition of an exercise programme to a comprehensive education on GTPS management. The improved outcomes of the responders in the GLoBE group indicate that there may be a subgroup of patients with a GTPS diagnosis that benefit from a GLoBE intervention programme.
Ganderton, 2016, Australia[361]	RCT	Gluteal (including GTPS)	Strengthening	Disability	Disability, participant/patient rating overall condition, QoL, NR	GLoBE intervention did not demonstrate additional benefit to comprehensive education in GTPS management.
Garcia, 2016, Spain[362]	RCT	Rotator cuff	Flexibility, strengthening, other	Disability	QoL, disability	In patients with impingement syndrome, a combination of ultrasonophoresis and an exercise programme is better than a combination of iontophoresis and the same exercise programme or the exercise programme alone.
Gardin, 2010, Sweden[363]	QE – without control	Achilles	Strengthening	Structure, disability	NA	Eccentric training provided improved pain and performance that was sustained over 4.2 years for Achilles tendinosis.
Gatz, 2020, Germany[364]	QE – with control (with pre-test)	Achilles	Strengthening	Structure	NA	No measurable effect using shear wave elastography was observed for either eccentric or eccentric and isometric groups on gastrocnemius medialis and lateralis over a 12-week intervention.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Gatz, 2020, Germany[365]	RCT	Achilles	Strengthening	Disability	Structure, disability, participant/patient rating overall condition	No additional clinical benefits of adding ISOs to a basic EE programme could be found in this preliminary RCT study over a period of 3 months. SWE was able to differentiate between insertional and midportion tendon tissue and localise reported symptoms to sublocations but this did not correlate with better clinical scores (VISA-A) over a 3-month follow-up period.
Gebremariam, 2014, Netherlands[366]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Given the lack of detail surrounding exercise protocols within the included studies, it was concluded that a large degree of ambiguity still exists around particular exercise protocols and modalities. Despite this, exercise is still a favourable treatment option.
Ferrer, 2018, United States[177]	Observational – cohort	Rotator cuff	Strengthening	Structure	PFC, disability	Exercise therapy improved measures of strength and patient-reported outcomes but did not have a significant impact on glenohumeral kinematics.
Giombini, 2006, Italy[367]	RCT	Rotator cuff	Flexibility	Pain over a specified time, pain on loading/ activity, clinical examination findings,	NA	Patients who received hyperthermia experienced significantly better pain relief than patients receiving ultrasound or exercises, making it an effective management for supraspinatus tendinopathy.
Giray, 2019 Turkey[368]	RCT	Lateral elbow	Strengthening, flexibility	Disability	PFC, pain over a specified time, pain on loading/ activity, disability	Kinesiotaping in addition to exercises is more effective than sham taping and exercises alone in improving pain in daily activities and arm disability due to lateral epicondylitis.
Goldgrub, 2016, Canada[369]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	The current evidence suggests that combining multiple interventions into one programme of care does not lead to superior outcomes for patients with subacromial impingement syndrome or nonspecific shoulder pain.
Gonsalves, 2012, Canada[370]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Exercise is an effective modality for treating rotator cuff tendinopathies with specific high-intensity regimes likely to be more beneficial than more general and low-intensity exercise regimes.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Gonzalez, 2018, Saudi Arabia[371]	QE – without control	Rotator cuff	Flexibility, other, strengthening	Participation, clinical examination findings	NA	The design of the intervention used was proven effective in treating shoulder impingement syndrome. It considered the need to increase the subacromial space, foster shoulder stability and avoid the interruption of the practice of physical activity.
González-Iglesias, 2011, Spain[372]	Observational – case series/ reports	Lateral elbow	Flexibility	Disability	Sensory modality-specific pain	Hypoalgesia and function improved for rock climbers with treatment.
Gornoski, 2014, United States[373]	Observational – case series/ reports	Patellar, Quadriceps, other – pesanserine	Flexibility, strengthening	Pain over a specified time, disability	NA	There is added benefit to electro-therapeutic point stimulation as an adjunct to standard stretching and strengthening exercise.
Granviken, 2015, Norway[374]	RCT	Rotator cuff	Other, flexibility, strengthening	Disability	Pain over a specified time, clinical examination findings, psychological factors, ROM, participation, participant/ patient rating overall	No significant differences in pain and disability were found between home exercises and supervised exercises of more than the first session of a 6-week exercise regime for people with subacromial impingement.
Grymel-Kulesza, 2007, Poland[375]	RCT	Rotator cuff	NR	Pain over a specified time, clinical examination findings, PFC, ROM	NA	A multi-modal physiotherapy regime which combined ultrasound, TENS, massage and exercise therapy may be more beneficial for treating rotator cuff tendinopathy than modalities using a comparable treatment regime composed of cryotherapy.
Gunay Ucurum, 2018, Turkey[376]	RCT	Rotator cuff	Strengthening, flexibility	Pain on loading/ activity, QoL, disability	NA	Application of ultrasound, interferential current and TENS in addition to exercise therapy in shoulder impingement syndrome treatment had similar improvements in terms of pain, function and physical component of QoL. However, interferential current treatment showed significantly better outcomes for the mental component of QoL.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Gürsel, 2004, Turkey[377]	RCT	Rotator cuff	Flexibility, strengthening	Pain on loading/activity, ROM, disability	NA	There is no added benefit to the use of 1-MHz US in combination with other interventions in the management of painful shoulder conditions to merit its wide use.
Gutierrez-Espinoza, 2020, Chile[378]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	There was no demonstrable clinical benefit of direct physiotherapist supervision to the early rehabilitation of SIS.
Haahr, 2003, Denmark[379]	RCT	Lateral elbow	Flexibility	Participant/patient rating overall condition	Other, participation, economic impact costs	Poor prognosis at 1 year of follow-up for lateral epicondylitis was related to manual work and high baseline pain, whilst no relation was found between the type of medical treatment given/chosen and prognosis.
Haahr, 2006, Denmark[43]	RCT	Rotator cuff	NA	impact costs, participation, participant/patient rating overall	NA	The results of surgical decompression were equal to those of conservative treatment, and the surgery group had more income transferrals during the first year of follow-up.
Haahr, 2005, Denmark[380]	RCT	Rotator cuff	Other	Disability, pain over a specified time	NA	Surgical treatment of rotator cuff syndrome with subacromial impingement was not superior to physiotherapy with training.
Habets, 2015, Netherlands[381]	Systematic reviews/secondary analysis	Achilles	NA	NA	NA	Strong evidence was found for both the Alfredson protocol and gradual onset of exercises during the first week with no definitive conclusion regarding the most effective training parameters.
Hakguder, 2011, Turkey[382]	QE – with control (with pre-test)	Rotator cuff	Flexibility, strengthening	Disability, pain on loading/activity, pain over a specified time	NA	Patients with SIS who have partial rupture of supraspinatus tendon benefit from physical therapy consisting of US, TENS, superficial heat and exercise, with a decrease in pain, limitation of motion, and increase in functional status in the short term.
Hallgren, 2014, Sweden[383]	RCT	Rotator cuff	Strengthening	Disability, other	Disability, pain on loading/activity, pain over a specified time, QoL	Specific exercises produced positive short-term improvements at 1-year follow-up and reduced the need for surgery. Full-thickness tear and a low CMS score appear to be predictors of poor outcome.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Hanratty, 2016, United Kingdom[155]	Qualitative	Rotator cuff	NA	NA	NA	Experienced musculoskeletal physical therapists believe that exercise is central in treating patients with SIS and that gaining patient buy-in to its importance, patient education, promoting self-management and postural advice are central to the successful treatment of people with SIS.
Hanratty, 2012, United Kingdom[384]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	16 studies were included. Physiotherapy exercises are effective in the management of SAIS. However, heterogeneity of the exercise interventions, coupled with poor reporting of exercise protocols, prevented conclusions being drawn about which specific components of the exercise protocols (i.e. type, intensity, frequency and duration) are associated with best outcomes.
Haslerud, 2015, Norway[28]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Optimal LLLT can offer clinically relevant pain relief and initiate a more rapid course of improvement, both alone and in combination with physiotherapy interventions.
Hawk, 2017, United states[385]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Low-moderate evidence exists in support of the use of MT as an efficacious treatment modality for SIS. In addition it was found that exercise, particularly when delivered as part of broader physical therapy treatment, was beneficial for SIS. Evidence is more limited for calcific tendonitis.
Hazar, 2014, Turkey[386]	Pilot – randomised	Rotator cuff	Strengthening	Pain without further specification, disability	NA	Throwers Ten exercise positively affected pain alleviation and functional recovery in shoulder impingement patients.
Head, 2019, United Kingdom[387]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	There is conflicting evidence regarding the superiority of eccentric loading over other types. Do-as-tolerated repetition volumes may be more effective at improving short-term function compared to the standardised Alfredson protocol.
Heitkamp, 2019, Germany[388]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	The Alfredson protocol and heavy slow resistance training may be the most recommendable types of calf muscle training.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Hernandez, 2006, Spain[389]	RCT	Lateral elbow	Flexibility, strengthening	Pain without further specification, function	NA	Combination of physical therapies with stretching and strengthening exercises effective for epicondylitis patients.
Heron, 2017, United Kingdom[390]	RCT	Rotator cuff	Flexibility, strengthening	Disability	NA	Open chain, closed chain and range of movement exercises all seem to be effective in bringing about short-term changes in pain and disability in patients with rotator cuff tendinopathy.
Herrington, 2007, United Kingdom[391]	Pilot – randomised	Achilles	Strengthening, flexibility	Disability	NA	The addition of a 12-week eccentric exercise programme to conventional treatment of ultrasound and deep transverse frictions is more effective in treating AT than conventional treatment alone.
Ho, 2007, China (SAR)[392]	Pilot – randomised	Lateral elbow	Strengthening, flexibility	PFC, sensory modality-specific pain,	NA	Exercise alone is already effective for the management of lateral epicondylitis. The addition of microcurrent therapy to exercise does not enhance the treatment effect.
Holmgren, 2012, Sweden[393]	RCT	Rotator cuff	Strengthening, flexibility	Disability	Pain on loading/activity, pain over a specified time, QoL, participant/patient rating overall condition, disability, other	Specific exercise strategy focussing on strengthening eccentric exercises for the rotator cuff and concentric/eccentric exercises for the scapula stabilisers is effective in reducing pain and improving shoulder function in patients with persistent subacromial impingement syndrome. By extension, this exercise strategy reduces the need for arthroscopic subacromial decompression at 3 months.
Hong, 2004, Canada[394]	Survey	Lateral elbow	NA	NA	NA	More than 30 different treatments used tor acute, subacute, and chronic lateral epicondylitis were identified. Treatments most commonly used by physiotherapists were stretching exercises, ice and ultrasound therapy.
Hong, 2004, Canada[395]	Survey	Lateral elbow	NA	NA	NA	Occupational therapists used a variety of interventions, including education, activities/exercises, assistive devices, environment and pain management modalities that differed according to the phases of their clients' condition.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Hoogvliet, 2013, Netherlands[396]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Short-term analgesic effects of manipulation techniques may allow for more vigorous stretching and strengthening exercises, which were found to be affective for recovery in lateral epicondylitis.
Horstmann, 2013, Germany[16]	RCT	Achilles	Other, flexibility	examination findings, participant/ patient rating overall condition, pain on loading/ activity, other	NA	Vibration training may be an alternative or a complementary treatment in patients who do not respond well to eccentric training, especially in those with insertional pain.
Houck, 2015, United States[397]	RCT	Tibialis posterior	Strengthening, flexibility	Disability, function, PFC	NA	A moderate-intensity, home-based exercise programme minimally improves outcomes over orthosis wear alone in participants with stage II TPTD. The improvements observed were smaller than those reported in some previous controlled and uncontrolled clinical trials, suggesting that positive effects on function and pain in response to exercise may require higher intensity than this home-based programme for participants with TPTD.
Hutchison, 2011, United Kingdom[398]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Methodological quality was adequate for all 9 studies; however, blinding was a limitation for most. Different interventions for AT with varying efficacy were reported. Therefore, there is insufficient evidence to determine which method of physiotherapy is most appropriate for a chronic mid-body AT.
Iglesias, 2018, Spain[399]	Observational – case series/ reports	Achilles	Strengthening	Disability, structure	NA	US-guided intra-tissue percutaneous electrolysis, dry-needling, diathermy and eccentric exercise are safe and clinically cost-effective treatment options in the management of mid-substance AT when delivered in conjunction with an eccentric exercise programme.
Ingwersen, 2017, Denmark[191]	RCT	Rotator cuff	Flexibility, other, strengthening	Disability	Pain over a specified time, pain on loading/ activity, PFC, ROM,	No superior benefit of PHLE was seen when compared with LLE in primary or secondary outcomes.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Innocenti, 2019, Italy[400]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Six RCTs and 2 cross-sectional studies were appraised. Studies presented low to moderate risk of bias. Musculoskeletal physiotherapy seems to be an effective treatment for patients with shoulder pain although it is still based on weak diagnostic clinical instruments. The adoption of more functional and prognostic assessment strategies is advisable to improve coherence between evaluation and treatment.
Jasnauskaitė-Gedrimė, 2018, Lithuania[401]	RCT	Rotator cuff	Other, flexibility, strengthening	ROM, PFC, QoL	NA	Visual feedback exercises had greater effect on shoulder functions and the QoL compared to auditory feedback exercises.
Jayaseelan, 2014, United States[402]	Observational – case series/ reports	Hamstring	Strengthening, other	Pain without further specification, function, palpation, participant/ patient rating	NA	In both runners, eccentric loading of the hamstrings, lumbopelvic stabilisation exercises, and trigger-point dry needling provided short- and long-term pain reduction and functional benefits.
Jayaseelan, 2017, United States[403]	Observational – case series/ reports	Achilles	Strengthening, flexibility	Pain without further specification, sensory modality specific pain, participant/ patient rating	NA	Joint mobilisation and manipulation in addition to eccentric exercise showed immediate improvements in symptoms and function which were maintained at 12 weeks and at 9 months.
Jayaseelan, 2019, United States[148]	Observational – case series/ reports	Achilles, patellar	Aerobic, flexibility	Pain without further specification, sensory modality specific pain, disability, other	NA	Tendinopathy, while often described as local pain and dysfunction, may be associated with dysfunction of the nervous system. Identifying and treating pain mechanisms in addition to relevant impairments may be an appropriate intervention approach for individuals with tendinopathy.
Jerosch, 2002, Germany[404]	QE – without control	Rotator cuff	Other	Disability, PFC	NA	The present study shows that patients with subacromial pathology suffer from a proprioceptive deficit which can be improved by a special rehabilitation programme within 4 weeks.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Johansson, 2005, Sweden[405]	RCT	Rotator cuff	Flexibility, strengthening	Examination findings, disability	NA	Acupuncture was more effective than ultrasound when applied in addition to home exercises.
Johansson, 2011, Sweden[406]	RCT	Rotator cuff	Flexibility, strengthening	Disability	QoL, participant/patient rating overall condition	Acupuncture treatments combined with home exercises and subacromial corticosteroid injection both decreased pain and improved function in SIS patients. Neither was superior to the other.
Jonsson, 2005, Sweden[186]	RCT	Patellar	Strengthening	Pain on loading/activity, disability, participant/patient rating overall condition	NA	Eccentric, but not concentric, quadriceps training on a decline board seems to reduce pain in jumper's knee
Johnson, 2012, United States[407]	Observational – case series/reports	Achilles	Flexibility	Disability	NA	The use of an AFO and stretching regimen improved FFI scores in patients suffering from retrocalcaneal heel pain.
Johnston, 1999, Canada[168]	Observational – case series/reports	Other – ilio-psoas syndrome	Flexibility, strengthening, other	Participant/patient rating overall condition	NA	Hip rotation strengthening and stretching programme appears to improve function with iliopsoas syndrome.
Jonsson (a), 2009, Sweden[408]	QE – without control	Achilles	Strengthening	Pain on loading/activity, participant/patient rating overall condition, disability	NA	Treatment with painful eccentric calf-muscle training showed good clinical results based on VAS scores, patient satisfaction and return to pre-injury activity levels in patients with chronic painful mid-portion Achilles tendinosis, but not in patients with chronic insertional Achilles tendon pain.
Jonsson (b), 2009, Sweden[408]	Pilot – non-randomised	Achilles	Strengthening	loading/activity, participant/patient rating overall	NA	The short-term pilot study demonstrated promise of a new eccentric exercise model for tendinopathy.
Jonsson (c), 2010, Sweden[408]	Pilot – non-randomised	Patellar	Strengthening	loading/activity, participant/patient rating overall	A	Eccentric strengthening exercise performed on a decline board had better pain relief and treatment satisfaction compared to a similar programme completed on a flat surface.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Jonsson, 2006, Sweden[409]	Pilot – non-randomised	Rotator cuff	Strengthening	Pain onload-ing/activity, participant/ patient rating	NA	Painful eccentric supraspinatus and deltoideus training might be effective at decreasing pain and improving function in SIS patients with a long duration of disabling pain symptoms.
Jonsson, 2008, Sweden[410]	Pilot – non-randomised	Achilles	Strengthening	loading/activity, participant/ patient rating overall	NA	This new model of painful eccentric calf-muscle training showed promising clinical results in the majority of patients.
Jowett, 2013, United Kingdom[411]	RCT	Rotator cuff	NA	Economic impact costs	NA	Corticosteroid injection plus exercise delivered by therapists may be a cost-effective use of resources compared with exercise alone and lead to lower healthcare costs and less time off work.
Juul-Kristensen, 2019, Denmark[412]	RCT	Rotator cuff	Other, flexibility, strengthening	Pain over a specified time	PFC, pain over a specified time	BIONEX and NEX were both effective in reducing pain to a clinically relevant level, while EMG biofeedback did not make a difference. The current neuromuscular shoulder exercise protocol is recommended.
Kachanathu, 2019, Saudi Arabia[413]	RCT	Lateral elbow	Flexibility	Pain without further specification	ROM, PFC	Wrist joint splinting in addition to physical therapy for a short duration was effective at improving pain intensity in patients with lateral epicondylitis.
Kachanatu, 2019, Saudi Arabia[414]	QE – without control	Rotator cuff	Flexibility, other	PFC	NA	SSE's significantly improved isometric hand grip strength of SIS patients.
Kachingwe, 2008, United States[415]	Pilot – randomised	Rotator cuff	Flexibility, other, strengthening	Pain over a specified time, disability, ROM	NA	Performing glenohumeral mobilisations and mobilisation-with-movement in combination with a supervised exercise programme may result in a greater decrease in pain and improved function for patients.
Kang, 2019, Taiwan[416]	RCT	Rotator cuff	Other, strengthening	Structure, disability, pain without further specification	NA	Four weeks of strengthening and stretching exercises with or without kinesiology taping improved functional performance in subjects with SIS and RSP. Kinesiology taping did not demonstrate an additional effect on RSP.
Kaux, 2014, Belgium[417]	QE – without control	Patellar	Flexibility, strengthening, aerobic, other	Pain without further specifica-tion, disability	NA	This re-educative protocol based on sub-maximal eccentric exercises added to PRP infiltrations decreased pain and improved function in patellar tendinopathy.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Kaux, 2015, Belgium[418]	Observational – case series/ reports	Patellar	Strengthening	Pain without further specifica-tion, disability, participation	NA	Local injection of PRP coupled with a programme of eccentric rehabilitation improves pain and functional symptoms of patients with chronic jumper's knee up to 1 year after injection.
Kaux, 2015, Belgium[419]	Observational – cohort	Patellar	Strengthening, flexibility	Loading/activity, sensory modality specific pain, disability, PFC	NA	Local infiltration of PRP combined with a submaximal
Kaya, 2011, Turkey[420]	QE – with control (with pre-test)	Rotator cuff	Strengthening, flexibility	Disability, pain over a specified time, pain without further specification, pain on loading/ activity	NA	kinesiotaping was more effective than the local modalities at the first week and the positive effect maintained at the second week of the treatment. Therefore, it may be an alternative treatment option for shoulder impingement syndrome.
Kaya, 2014, Turkey[421]	Pilot – randomised	Rotator cuff	Flexibility, Strengthening	Pain on loading/ activity, pain over a specified time, disability, structure	NA	There were no differences in pain reduction and disability between kinesiotaping with exercise and MT with exercise in patients with subacromial impingement.
Kearney, 2013, United Kingdom[422]	Pilot – randomised	Achilles	Strengthening	Disability	QoL	This pilot study provided key data to inform a larger study and shows that the methodology is feasible.
Kearney, 2010, United Kingdom[423]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	11 articles met the eligibility criteria. There is a consensus that conservative methods should be used before operative interventions. Current evidence for conservative treat-ment favours eccentric loading and shockwave therapy, although there is limited evidence by which to judge their effectiveness.
Kedia, 2014, United States[424]	RCT – cluster	Achilles	Strengthening	QoL, dis-ability, pain without further specification	NA	Conventional physical therapy consisting of gastrocnemius, soleus and hamstring stretches, ice massage on the Achilles tendon, and use of heel lifts and night splints with or without eccentric training is effective for treating insertional AT.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Kelly, 2010, United Kingdom[424]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Exercise is shown to be effective to some degree in the management of subacromial impingement syndrome, although methodological quality must be taken into account.
Kesikburun, 2013, Turkey[425]	RCT	Rotator cuff	Flexibility, strengthening	Disability	Examination findings, ROM, adverse effects/ even ts, disability	At 1-year follow-up, a PRP injection was found to be no more effective in improving QoL, pain, disability, and shoulder ROM than placebo in patients with chronic RCT who were treated with an exercise programme.
Ketola, 2009, Finland[426]	RCT	Rotator cuff	Other, strengthening	Pain without further specification	Pain over a specified time, disability, participation	Arthroscopic acromioplasty provides no clinically important effects over a structured and supervised exercise programme alone in terms of subjective outcome or cost-effectiveness when measured at 24 months.
Ketola, 2017, Finland[427]	RCT	Rotator cuff	Other, strengthening	Pain without further specification	Participation, disability, pain over a specified time	The natural history of rotator cuff tendinopathy probably plays a significant role in the results in the long term. Even though the patients who underwent operative treatment had a stronger belief in re covery from surgery, the exercise group obtained similar results. Both intention-to-treat and per protocol analysis showed no significant differences between the two groups.
Ketola, 2015, Finland[428]	RCT	Rotator cuff	Strengthening	Pain without further specification	Pain over a specified time, disability, participation	Both treatment groups had less pain at 2 and5 years. Duration of symptoms, marital status (single), long periods of sick leave, and lack of professional education appeared to increase the risk of persistent pain despite the treatment. Patients with impingement with radiological acromioclavicular (AC) joint degeneration also had more pain. Based on our findings, it is difficult to recommend arthroscopic acromioplasty for any specific subgroup. Patients in the exercise group who later went on with surgical option did not get better after the operation, which further challenges the development of a treatment algorithm as it suggests those who do not respond to non-operative treat ment should not be operated on either.
Ketola, 2016, Finland[429]	RCT	Rotator cuff	Other	Structure	NA	Arthroscopic acromioplasty does not have any long-term benefit based on radiological findings of muscle volumes. Also, the frequency of perforating supraspinatus rupture was similar irrespective of whether or not surgery was performed. Acromioplasty is not justified as a treatment for dynamic shoulder impingement syndrome.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Kim, 2016, Korea (Republic of)[430]	RCT	Rotator cuff	Strengthening	Pain without further specification, disability, ROM, physical function	NA	Neurac training is a more effective treatment for acute SIS when improvements in muscular strength are also desired.
Kim, 2017, Korea (Republic of)[431]	RCT	Rotator cuff	Other	Pain without further specification, ROM, physical function	NA	The use of visual feedback and 3D motion images can improve pain and function in SIS.
Kim 2019, Korea (Republic of)[432]	control (with pre-test)	Rotator cuff	Other, strengthening	Disability, structure	NA	Exp group (PRP) had better clinical outcomes than exercise.
Kim, 2020, Korea (Republic of) [433]	RCT	Rotator cuff	Other, strengthening	Function capacity, pain without further specification, Disability, ROM	NA	Both the Neurac modality and MT induced pain relief, improved function, and increased ROM. The Neurac intervention also resulted in a significant enhancement of shoulder muscle strength, indicating its superiority as an effective therapeutic modality for this particular patient group.
Kim, 2020, Korea (Republic of)[434]	QE – without control	Posterior tibial tendon	Strengthening	PFC	NA	A 4-week SFE programme may have positive effects on changing muscle activation patterns for tibialis anterior and fibularis longus muscles. Although it could not influence their structural deformity and ankle joint movement, it could produce a potential benefit of decreased tibialis posterior activation.
Kingma, 2007, Netherlands[435]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	The effects of eccentric exercise training in patients with chronic AT on pain are promising; however, the magnitude of the effects cannot be determined.
Knobloch, 2008, Germany[436]	RCT	Achilles	Strengthening	Pain without further specification, structure	NA	No microcirculatory changes are evident in non-compliant and compliant patients with AT undergoing 12 weeks of eccentric training.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Knobloch, 2007, Germany[192]	QE – without control	Achilles	Strengthening	Disability, structure	NA	12-week eccentric training is not harmful to microcirculatory Achilles tendon level. It is beneficial, easy to apply and should be promoted broadly among patients with mid-portion as well as insertional tendinopathy without bony abnormalities as the microcirculatory changes and the pain-level reduction indicate that both groups may benefit from painful eccentric training.
Knobloch, 2008, Italy[437]	RCT	Achilles	Strengthening	Pain without further specification, disability, structure	NA	Patients with tendinopathy of the main body of the AT experienced improved clinical outcome with both management options. Although tendon microcirculation was optimised in the combined group of eccentric training and AirHeel Brace, these micro-vascular advantages do not translate into superior clinical performance when compared with eccentric training alone.
Knobloch, 2010, Germany[182]	Observational – cohort	Achilles	Strengthening	Pain on loading/activity, disability	NA	Symptomatic females suffering AT do not benefit as much as symptomatic males from 12 weeks of eccentric training as far as pain reduction and improvement of VISA-A scores are concerned.
Kongsgaard, 2009, Denmark[21]	RCT	Patellar	Strengthening	Disability	Pain on loading/activity, participant/patient rating overall condition, structure	Corticosteroid injection has good short-term but poor long-term clinical effects, in patellar tendinopathy. Heavy-slow resistance exercise has good short- and long-term clinical effects accompanied by pathology improvement and increased collagen turnover.
Kongsgaard, 2010, Denmark[438]	Observational – cohort	Patellar	Strengthening	Disability, pain on loading/activity, structure	NA	Positive clinical effect of heavy resistance training was accompanied by changes in fibril morphology, perhaps indicative of more new fibrils.
Korakakis, 2018, Qatar[439]	Systematic reviews/secondary analysis	Gluteal (including GTPS), hamstring,	NA	NA	NA	Low level of evidence suggests that ESWT may be effective for some lower-limb conditions in the short, mid and long-term management of PHT.
Koszalinski, 2020, United States[440]	Pilot – feasibility	Achilles	Strengthening, flexibility	Function	Modality specific pain, participant/patient rating overall condition, pain without further specification, PFC	Significant differences reported for within-group analysis for FAAM, NPRS, pain pressure threshold and strength in both groups at 4 weeks and 3 months.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Kramer, 2010, Germany[441]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Although no recommendations can yet be made regarding dosage and duration, the effects of eccentric training in conservative treatment of chronic mid-portion-AT are promising.
Kristensen, 2012, United Kingdom[442]	Systematic reviews/ secondary analysis	Achilles, patellar	NA	NA	NA	Resistance training is a valuable method of conservative treatment for chronic musculoskeletal conditions irrespective of age or gender. Higher-intensity approaches were more efficacious than those of lower intensities. Furthermore high-intensity RT did not increase the likelihood of injury provided that regimes introduce loads progressively.
Kromer, 2013, Germany[443]	RCT – cluster	Rotator cuff	Strengthening, flexibility, other	Disability, participant/ patient rating overall condition	Pain over a specified time, participant/ patient rating overall condition	Individually adapted exercises were effective in the treatment of patients with shoulder impingement syndrome. Individualised manual physi otherapy contributed only a minor amount to the improvement in pain intensity.
Kromer, 2009, Germany[444]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	This review shows an equal effectiveness of physiotherapist-led exercises compared with surgery in the long term and of home-based exercises compared with combined physiotherapy interventions in patients with shoulder impingement syndrome.
Kromer, 2014, Germany[445]	RCT	Rotator cuff	Strengthening, flexibility, other	Disability, participant/ patient rating overall condition	Disability, psychological factors, economic impact costs	The use of MT including physiotherapy provides no additional benefits and is more expensive in comparison to exercise-only interventions.
Kuhn, 2009, United States[446]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Exercise is effective as a treatment for the reduction of pain and improving function but fewer statistical and clinical significant effects are seen on the ROM or strength. Supervised exercise was not different than HEPs.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Kulig, 2009, United States[447]	Observational – case series/reports	Posterior tibial tendon	Flexibility, strengthening	PFC, participant/patient rating overall condition, disability, pain on loading/activity, physical activity	NA	A 10-week tendon-specific eccentric programme resulted in improvements in symptoms and function without changes in tendon morphology or neovascularisation.
Kulig, 2009, United States[448]	RCT	Posterior tibial tendon	Strengthening	Disability, PFC, Pain on loading/activity	NA	People with early stage tibialis posterior tendinopathy benefited from a programme of orthoses wear and stretching. Eccentric and concentric progressive resistive exercises further reduced pain and improved perceptions of function.
Kvalvaag, 2017, Norway[449]	RCT	Rotator cuff	Strengthening, other	Disability	Pain on loading/activity, function, medication use	Radial ESWT offered no additional benefit to supervised exercises in the treatment of subacromial shoulder pain after 24 weeks, except in the subgroup of patients with calcification in the rotator cuff.
Kvalvaag, 2018, Norway[450]	RCT	Rotator cuff	Flexibility, strengthening	Disability	Pain on loading/activity, pain over a specified time, function, QoL, participation	Radial ESWT was not superior to sham rESWT in addition to supervised exercises in the long term for patients with subacromial pain syndrome. Marital status (single), frequent use of pain medication, not working at baseline, negative outcome expectations, low self-reported general health status and few supervised exercise sessions predicted a poor outcome on SPADI after one year.
Laitinen, 2017, Finland[451]	Systematic reviews/secondary analysis	Hamstring, patellar, Achilles	NA	NA	NA	For both patellar and AT, eccentric exercise was effective in relieving pain, but less consistent evidence for tendinopathic changes. HSR exercise was equally as effective as eccentric training for pain relief and appears superior for patient satisfaction. Combining stretching and eccentric training appeared to enhance effects of pain relief. In general, there are beneficial effects for at least one outcome across all the modalities studied.
Land, 2019, Australia[452]	RCT	Rotator cuff	Flexibility	ROM	Pain without further specification, disability	Upper thoracic and posterior shoulder interventions with a targeted home exercise that addresses thoracic spine or posterior shoulder tightness improves the signs and symptoms of SIS.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Langberg, 2007, Denmark[133]	QE – with control (with pre-test)	Achilles	Strengthening	Structure, pain on loading/ activity	NA	12 weeks of eccentric training stimulates collagen type I synthesis in chronically injured human Achilles tendon. This increased synthesis is accompanied by a significant reduction in pain in the tendon during loading.
Larsson, 2012, Sweden[453]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	Eccentric exercise should be considered as an effective treatment modality for patellar tendinopathy.
Larsson, 2019, Sweden[454]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Seven studies (eight articles) were included, six were meta-analysed. Included studies were of moderate quality. Evidence of low certainty suggests that eccentric exercise may provide a small but likely not clinically important reduction in pain compared with other types of exercise in patients with subacromial impingement syndrome. It is uncertain whether eccentric exercise improves function more than other types of exercise (very low certainty of evidence).Methodological limitations of existing studies make these findings susceptible to change in the future.
Leduc, 2003, Canada[455]	RCT	Rotator cuff	Flexibility	Disability, ROM, structure	NA	Treatment of calcifying tendinitis of the shoulder with acetic acid iontophoresis and physiotherapy did not result in better clinical or radiological effects than those observed in subjects treated with physiotherapy alone. SPADI score and shoulder ROM improved significantly in both groups.
Lee, 2014, Korea (Republic of)[456]	RCT	Lateral elbow	Flexibility, strengthening	Further specifi-cation, disability, physical function	NA	Three days per week for 3 weeks of physical therapy improves pain and function in patients with acute lateral epicondylitis. After 3 weeks, 6 days per week is the most effective treatment frequency.
Lee, 2017, Hong Kong, China (SAR)[457]	RCT	Patellar	Strengthening	On loading/ activity, pain over a specified time, disability	NA	Eccentric exercise-induced modulation on tendon mechani-cal properties and clinical symptoms i associated in athletes with patellar tendinopathy.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Lee, 2016, Korea (Republic of)[458]	QE – without control	Rotator cuff	Strengthening	PFC	NA	Closed kinetic chain shoulder exercise was effective in increasing shoulder-IR and -ER peak torque, which is related to improved throwing velocity in baseball players.
Lee, 2017, China[459]	QE – with control (with pre-test)	Patellar	Strengthening	Over a specified time, pain on loading/activity, disability	NA	Eccentric exercise alone was effective in increasing tendon strain and reducing pain. The addition of ESWT did not provide any further benefits.
Levy, 2009, United Kingdom[150]	Qualitative	Achilles, patellar, rotator cuff	NA	NA	NA	Five themes – motivation, confidence, coping, social support, and pain emerged from the thematic analysis. Specifically, a lack of motivation and confidence was perceived to have a negative effect upon home-based rehabilitation adherence while ineffective coping strategies, over support and pain, appeared to have an adverse influence on rehabilitation adherence in a clinic setting. The use of effective coping strategies and varied types of social support aided reha bilitation adherence.
Lim, 2018, Australia[12]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	Fifteen studies (3 isometric, 2 HSR, and 10 eccentric) were included for this review. It is recommended that the findings from isometric exercises (Grade A) can be trusted to guide clinical practice, whereas eccentric exercises (Grade B) can be trusted to guide clinical practice in most clinical situations. It is recommended that HSR exercises (Grade C) should be applied carefully to individual clinical circum-stances and interpreted with care.
Littlewood, 2012, United Kingdom[35]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Home and supervised exercise programmes might be more effective than no intervention or placebo and as effective as minimal or active comparators (brace, physiotherapy, surgery).
Littlewood, 2013, United Kingdom[7]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	26 reviews were retrieved. Exercise and multimodal physio-therapy appear to be effective interventions for rotator cuff tendinopathy, although the clinical significance of this effect is unclear. Combining MT with exercise is not currently supported, neither is the use of corticosteroid injections or acupuncture. This interpretation is drawn from systematic reviews comprising mainly small RCTs that frequently measure outcome in a heterogeneous manner, limiting the strength of any conclusions.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Littlewood, 2014, United Kingdom[460]	Pilot – randomised	Rotator cuff	Strengthening	Disability	QoL, Other	Greater improvements in SPADI score were observed in the self-management exercise group.
Littlewood, 2016, United Kingdom[34]	RCT	Rotator cuff	Strengthening	Disability	Disability	Self-management programmes based on a single exercise were comparable to usual physiotherapy in the short, medium and long term.
Littlewood, 2014, United Kingdom[156]	Qualitative	Rotator cuff	NA	NA	NA	With certain caveats including the need to recognise and respond to individual characteristics, implement effective knowledge translation strategies and the need to engage with appropriately timed pro-active follow-up, the potential to implement programmes of self-managed loaded exercise for patients with rotator cuff tendinopathy in the real world and in further research studies appears feasible but challenging.
Littlewood, 2015, United Kingdom[23]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Contextual factors related to the therapist and the patient, for example, geographical location and setting, do not appear to significantly influence treatment outcomes. Resistance training is an important element in the rehabilitation process; however, the optimal level of resistance and other dosage factors remains unclear. Programmes should generally be conducted for 12 weeks to display good results.
Littlewood, 2015, United Kingdom[107]	Qualitative	Rotator cuff	NA	NA	NA	Some physiotherapist-related barriers and facilitators concerning implementation of research findings identified included the apparent differences between the preferred therapeutic approach of the physiotherapists and the self-managed exercise inter vention. The physiotherapists recognised their role as knowledge translators but certain attributes of the intervention appeared to serve as both a barrier and facilitator, particularly the simplicity. Opinion regarding the optimal symptom response during exercise prescription also differed. These factors need to be recognised and considered.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Long, 2015, United Kingdom[461]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Clinical effectiveness evidence from the high-quality systematic reviews identified in this overview continues to suggest uncertainty as to the effectiveness of many conservative interventions for the treatment of LET. Although new RCT evidence has been identified with either placebo or active controls, there is uncertainty as to the size of effects reported within them because of the small sample size. Conclusions regarding cost-effectiveness are also unclear.
Lopez-de-Celis, 2018, Spain[462]	RCT	Lateral elbow	Flexibility	Pain over a specified time	Sensory modality specific pain, PFC, disability, participant/ patient rating overall condition	Diacutaneous fibrolysis added to physical therapy provides better results (including pain-free grip strength) in the treatment of chronic lateral epicondylalgia, with greater clinical satisfaction among patients.
Ludewig, 2003, United States[463]	RCT	Rotator cuff	Flexibility, strengthening	Disability	NA	HEPs are more effective in reducing symptoms and improving function (Shoulder Rating Questionnaire, shoulder satisfaction score) than the control group in construction workers with shoulder pain.
Luginbuhl, 2008, Switzerland[174]	RCT	Lateral elbow	Strengthening	function capacity, ROM, disability	NA	No beneficial effect of either the forearm support band or the strengthening exercises could be found.
Maenhout, 2013, Belgium[464]	RCT	Rotator cuff	Strengthening	Disability, participant/ patient rating overall condition, PFC	NA	Adding heavy-load eccentric training resulted in a higher gain in isometric strength at 90 degrees of scapular abduction, but was not superior for decreasing pain and improving shoulder function. The addition of a limited number of physiotherapy sessions combined with a daily HEP is highly effective in patients with impingement.
Maffulli, 2008, United Kingdom[465]	QE – without control	Achilles	Strengthening, flexibility	Disability	NA	Eccentric exercises in athletic patients provide comparable clinical outcome compared to our previous results in non-athletic patients.
Maffulli, 2015, United Kingdom[466]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	There was no significant evidence to advise any particular pharmacological treatment as the best advisable non-operative option for AT.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Mafi, 2001, Sweden[467]	RCT	Achilles	Strengthening	loading/activity, participant/patient rating overall	NA	Eccentric calf muscle training showed superior results to concentric training in the treatment of chronic Achilles tendinosis based on patient satisfaction and return to activity level.
Magnussen, 2009, United States[468]	Systematic reviews/secondary analysis	Achilles	NA	NA	NA	There was more evidence in support of eccentric exercise in comparison to the other conservative treatment methods assessed (e.g. ESWT, injections, sclerosing agents).
Malliaras, 2013, United Kingdom[61]	Systematic reviews/secondary analysis	Achilles, patellar	NA	NA	NA	Lack of high-quality evidence. Findings do not support eccentric-only exercise. Clinicians recommended to consider eccentric-concentric exercise with or without eccentric-only exercise for Achilles and patellar tendinopathy. More high-quality research required.
Manias, 2006, Greece[469]	RCT	Lateral elbow	Flexibility, strengthening	Pain over a specified time, other	NA	Supplementing exercise with ice offers no added benefit to patients with LET.
Mani-Babu, 2014, United Kingdom[27]	Systematic reviews/secondary analysis	Gluteal (including GTPS), patellar, Achilles	NA	NA	NA	Moderate evidence indicates that (1) ESWT is more effective than home training and corticosteroid injection in the short and long term for GTPS, (2) ESWT is more effective than eccentric loading for insertional AT and equal to eccentric loading for midportion AT in the short term, and (3) combining ESWT and eccentric loading in midportion AT may produce superior outcomes to eccentric loading alone. Therefore, ESWT is an effective intervention and should be considered for GTPS, PT and AT particularly when other nonoperative treatments have failed.
Marik, 2017, United States[470]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	There is strong evidence that ROM, strengthening exercises and joint mobilisations can improve function and decrease pain in people with SIS.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Martinez-Silvestrini, 2005, United States[471]	QE – with control (with pre-test)	Lateral elbow	Flexibility, strengthening	function capacity, disability, QoL, pain without further specification, participant/patient rating	NA	No significant differences in outcome among the groups.
Marzetti, 2014, Italy[472]	RCT	Rotator cuff	Other	Disability	Participant/patient rating overall condition, pain on loading/activity, pain over a specified time	Neurocognitive rehabilitation is effective in reducing pain and improving function in patients with shoulder impingement syndrome, with benefits maintained for at least 24 weeks.
Masood, 2014, Finland[166]	QE – without control	Achilles	Strengthening	PFC, structure, disability, pain without further specification	NA	Eccentric rehabilitation was effective in improving leg strength in AT. It also resulted in redistribution of relative electrical activity, but not metabolic activity, within the triceps surae muscle.
Matthew, 2013, United Arab Emirates[473]	Observational – case series/reports	Rotator cuff	Other, strengthening, flexibility	Pain without further specification, ROM, disability	NA	Glenohumeral mobilisations with movement combined with a supervised exercise programmemay result in a greater decrease in pain and improved function.
Mayer, 2007, Germany[474]	RCT	Achilles	Strengthening, other	Disability, pain on loading/activity, PFC	NA	A 4-week treatment of deep friction and ultrasound in combination with sensorimotor and eccentric training, as well as insoles with longitudinal arch support, might reduce pain (at rest and in activity) in most patients with AT.
McAleenan, 2010, United Kingdom[475]	Pilot – randomised	Achilles	Strengthening	Disability	Function, participant/patient rating overall condition	Eccentric exercise combined with a night splint appears to improve outcomes in AT over the control group.
Mc Auliffe, 2017, Ireland[476]	Qualitative	Achilles	NA	NA	NA	Persistent AT is associated with a significant psychosocial impact, particularly in terms of participation in daily life and valued activities.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
McClure, 2004, United States[477]	Observational – cohort	Rotator cuff	Strengthening, flexibility, other	function capacity, disability, QoL	NA	Findings suggest a relatively simple exercise programme combined with patient education may be effective.
McCormack, 2016, United States[478]	RCT	Achilles	Strengthening	Disability	specified time, participant/patient rating overall condition	Soft tissue treatment (Astym) plus eccentric exercise was more effective than eccentric exercise alone at improving function during both short- (26 weeks) and long-term (52 weeks) follow-up periods.
McDevitt, 2020, United States[479]	Observational – case series/reports	Other – bicipital tendinopathy	Strengthening, flexibility	Specified time, clinical examination findings, participant/patient rating overall	NA	Findings from this case series suggest that DN and eccentric-concentric exercise may be beneficial for the management of patients with chronic BT tendinopathy.
Melegati, 2000, Italy[480]	RCT	Rotator cuff	Flexibility, strengthening	Disability	NA	Groups A (kinesitherapy) and B (ESWT + kinesitherapy) achieved a significant constant score improvement, whereas the increase in group C (control) was not significant.
Mellor, 2018, Australia[30]	RCT	Gluteal (including GTPS)	Strengthening, other	Participant/patient rating overall condition, pain over a specified time	Disability, function, PFC, psychological factors, physical activity, QoL	EDX is an effective management approach for gluteal tendinopathy. Education plus exercise and corticosteroid injection use resulted in higher rates of patient-reported global improvement and lower pain intensity than no treatment at 8 weeks. In the long term (52-weeks), education plus exercise led to better global improvement than corticosteroid injection use, but no difference in pain intensity.
Mendonça, 2020, Netherlands[481]	Systematic reviews/secondary analysis	Patellar	NA	NA	NA	Compared to minimal intervention, conservative treatment did not improve pain and function in patients with patellar tendinopathy.
Menek, 2019, Turkey[482]	RCT	Rotator cuff	Flexibility, strengthening	Pain without further specification, ROM, disability, QoL	NA	Mulligan mobilisation was more effective than general treatment methods for pain as well as normal joint motion, DASH scoring and some parameters of SF-36 compared with general treatment methods.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Menta, 2015, Canada[483]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Based on the findings of this review, the relative effectiveness of stretching vs. strengthening for the wrist extensors remains unclear for the management of persistent lateral epicondylitis.
Meyer, 2009, New Zealand[24]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Owing to insufficient reported compliance data, a conclusion on the relative effectiveness of various compliances was not feasible. According to our review, the relative effectiveness of various dosages of eccentric exercises for AT is still unclear
Miccinilli, 2018, Italy[484]	RCT	Rotator cuff	Flexibility, strengthening	loading/activity, disability, ROM, PFC	NA	Our findings are not strong enough to recommend the application of kinesio-taping during RC tendinopathy rehabilitative treatment.
Michener, 2004, United States[485]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	The low to mediocre methodologic quality, small sample sizes and general lack of long-term follow-up limit these findings for the development of useful clinical practice guidelines. The limited evidence currently available suggests that exercise and joint mobilisations are efficacious for patients with SAIS. Laser therapy appears to be of benefit only when used in isolation, not in combination with therapeutic exercise. Ultrasound is of no benefit, and acupuncture trials present equivocal evidence.
Morgan, 2019, United States[486]	Observational – case series/ reports	Rotator cuff	Strengthening, flexibility	Disability	Pain over a specified time, ROM, participant/patient rating overall condition	This case series provides insight to the observed short- and intermediate-term effects of dry needling combined with exercise for subacromial pain syndrome. The results are encouraging for dry needling as an adjunct to exercise for treating patients with subacromial pain syndrome.
Morton, 2014, United Kingdom[487]	Observational – case series/ reports	Patellar	Aerobic, strengthening	Participant/ patient rating overall condition, adverse effects/ events,	NA	High-volume image-guided injections should be considered in the management of recalcitrant PT as the majority of subjects showed improvement in their VISA-P score.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Morton, 2015, United Kingdom[488]	Observational – case series/reports	Gluteal (including GTPS)	Aerobic, strengthening	Pain without further specification, disability	NA	Both the retrospective and prospective groups showed a statistically significant reduction in pain following a high-volume guided injection and structured rehabilitation in patients with GTPS.
Mulligan, 2016, United States[489]	RCT – cross-over	Rotator cuff	Other, strengthening, flexibility	Loading/activity, disability, function, participant/patient rating overall	NA	Patients with SAIS demonstrate improvement in pain and function with a standardised programme of physical therapy regardless of group exercise sequencing.
Munteanu, 2015, Australia[490]	RCT	Achilles	Strengthening	Disability, participation	QoL, physical activity, participant/patient rating overall condition, other	Customised foot orthoses, prescribed according to the protocol in this study, are no more effective than sham foot orthoses for reducing symptoms and improving function in people with mid-portion AT undergoing an eccentric calf-muscle exercise programme.
Murphy, 2018, Australia[491]	Systematic reviews/secondary analysis	Achilles	NA	NA	NA	A total of 31 separate cohorts (24 studies) were eligible, with follow-up ranging from 2 weeks to 6 months. An improvement in pain and function as early as 2 weeks that appeared to peak at 12 weeks was demonstrated.
Murphy, 2019, Australia[492]	Systematic reviews/secondary analysis	Achilles	NA	NA	NA	Seven studies met the inclusion criteria. Current evidence suggests that HECT may be superior to natural history and traditional physiotherapy while HECT may be inferior to other exercise interventions. However, due to methodological limitations, small sample size and a lack of data we are unable to be confident in the results of the estimate of the effect, as the true effect is likely to be substantially different.
Nazligul, 2018, Turkey[493]	RCT	Rotator cuff	Flexibility	specified time, pain on loading/activity, disability	NA	IFC therapy had no additional benefit over NSAID, cryotherapy and exercise programme in the treatment of SIS.
Newcomer, 2001, United States[494]	RCT	Lateral elbow	Flexibility, strengthening	further specification, disability, physical	NA	A corticosteroid injection does not provide a clinically significant improvement in the outcome of LE.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Nha Hong, 2004, Canada[495]	Survey	Lateral elbow	NA	NA	NA	More than 30 different treatments used for acute, subacute and chronic lateral epicondylitis were identified. Treatments most commonly used by physiotherapists were stretching exercises, ice an d ultrasound therapy. The results serve as a baseline to guide future research.
Nilsson, 2007, Sweden[496]	Pilot – non-randomised	Lateral elbow	Strengthening, flexibility	Disability, PFC, participation	NA	A 4-week structured home training programme can improve function and reduce sick leave in patients with lateral epicondylitis. Positive effects were sustained over 16 weeks.
Nimgade, 2005, United States[497]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Steroid injections appear the most successful short-term intervention for pain relief. Active physiotherapy appears efficacious regardless of time frame.
Nishizuka, 2017, Japan[498]	RCT	Lateral elbow	Flexibility	Disability	Pain without further specification, participant/patient rating overall condition, clinical examination findings	A forearm band may have no more than a placebo effect and is not recommended based on its effectiveness.
Norregaard, 2007, Denmark[499]	RCT	Achilles	Strengthening	Palpation, participant/patient rating overall condition, disability	NA	Symptoms gradually improved during the 1-year follow-up period and were significantly better assessed by pain and symptoms after 3 weeks and all later visits. However, no significant differences could be observed between the two groups.
Notarnicola, 2014, Italy[500]	QE – with control (with pre-test)	Achilles	Flexibility, strengthening	Pain without further specification, disability	NA	Cryo high-energy laser therapy (CHELT) gave quicker and more effective pain relief compared to ESWT at 2-month and 6-month follow-up.
Nowotny, 2018, Germany[501]	RCT	Lateral elbow	Strengthening	further specification, PFC, ROM, disability	NA	The use of an elbow orthosis appears to reduce pain and improve other subjective outcome measures. However, the long-term results do not appear to be any greater than those received through physiotherapy alone.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Nyberg, 2010, Sweden[502]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Exercise may be as effective as surgery in SIS patients, particularly high-dose exercise and exercise in combination with MT.
Ohberg, 2004, Sweden[503]	QE – without control	Achilles	Strengthening	Structure, participation, participant/ patient rating overall condition	NA	A good clinical result after eccentric training seems to be associated with a more normal tendon structure and no remaining neovascularisation. Action on the area with neovessels during the eccentric training regimen might possibly be responsible for the good clinical results.
Ohberg, 2004, Sweden[504]	QE – without control	Achilles	Strengthening	Structure, participant/ patient rating overall condition	NA	Eccentric calf-muscle training in patients with painful mid-portion chronic Achilles tendinosis has good short- and mid-term clinical results. At ultrasonographic follow-up, in most patients, tendon thickness is decreased and the structure is normalised. Structural abnormalities that remain at follow-up seem to be associated with residual pain in the tendon
Oken, 2008, Turkey[505]	RCT	Lateral elbow	Strengthening, flexibility	function capacity, pain over a specified time, participant/ patient rating	NA	A brace has a shorter beneficial effect than US and laser therapy in reducing pain in lateral epicondylitis. Laser therapy is more effective than the brace and US treatment in improving grip strength.
Olaussen, 2015, Norway[506]	RCT	Lateral elbow	Flexibility, strengthening	Participant/ patient rating overall condition	further specification, function, PFC, pain – clinician applied stress/examination, disability, adverse effects/ events	Placebo injection with physiotherapy consisting of deep transverse friction massage, Mills manipulation, stretching and eccentric exercises showed no clear beneficial effect on acute lateral epicondylitis. CI with physiotherapy had a large positive effect on success of treatment at 6 weeks, no difference at 12 weeks, worsening at 26 weeks but no significant negative effect at 52 weeks compared to control. No significant differences in primary and secondary measures between CI and placebo injection suggest no added effect to steroid injection.

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TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Olaussen, 2013, Norway[507]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Manipulation with exercise and exercise with stretching have a short-term effect on lateral elbow tendinopathy outcomes, with the latter also having a long-term effect.
O'Neill, 2015, United Kingdom[508]	Control (with pre-test)	Achilles	Strengthening	PFC	NA	Eccentric rehabilitation significantly increases endurance capacity of the symptomatic and non-symptomatic leg.
Orscelik, 2016, Turkey[509]	Observational – cohort	Lateral elbow	flexibility, strengthening	further specification, disability	NA	Prolotherapy is a safe and effective treatment for chronic LE.
Ortega-Castillo, 2016, Spain[510]	Systematic reviews/ secondary analysis	Rotator cuff, lateral elbow	NA	NA	NA	12 studies were selected. Eccentric exercise may reduce pain and improve strength in upper-limb tendinopathies, but whether its effectiveness is much better than other forms of treatment remains questionable.
Osteras, 2008, Norway[511]	RCT	Rotator cuff	Aerobic, strengthening	Participation, economic impact costs	NA	In patients with chronic subacromial pain, high-dose exercise therapy might be an efficient treatment approach.
Osteras, 2009, Norway[512]	RCT	Rotator cuff	Aerobic, strengthening, flexibility	Pain without further specification	Disability, PFC	There is a dose–response effect when using active graded exercises to treat patients with long-standing subacromial pain.
Osteras, 2010, Norway[513]	Observational – case series/ reports	Rotator cuff	Aerobic, strengthening	loading/activity, PFC,	NA	In patients with uncomplicated subacromial pain syndrome, high-dosage medical exercise therapy might be an efficient treatment approach.
Osteras, 2010, Norway[514]	RCT	Rotator cuff	Strengthening, aerobic	Pain on loading/ activity	NA	In long-term subacromial pain syndrome, high-dosage medical exercise therapy is superior to a conventional low-dosage exercise programme.
Ozgen, 2012, Turkey[515]	RCT	Rotator cuff	Flexibility, strengthening	Loading/activity, Pamin over a specified time, disability, participant/ patient rating overall condition, Medication	NA	Physical therapy modalities and sodium hyaluronate application supplemented by HEP had similar effects in short and long term for ST. Sodium hyaluronate application may be a better alternative with regard to effectiveness and side effects for other treatment methods applied intra-articulary.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Paavola, 2018, Finland[516]	RCT	Rotator cuff	Flexibility, strengthening, other	Pain on loading/activity	QoL, participant/patient rating overall condition	Arthroscopic subacromial decompression provided no benefit over diagnostic arthroscopy in patients with shoulder impingement syndrome.
Page, 2016, Australia[517]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	Effects of MT and exercise may be similar to those of glucocorticoid injection and arthroscopic subacromial decompression, but this is based on low-quality evidence. Adverse events associated with MT and exercise are relatively more frequent than placebo but mild in nature.
Page, 2016, Australia[518]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	47 trials, with exercise included as adjunct. PEMF may not provide clinically relevant benefits over placebo, and therapeutic ultrasound, LLLT and PEMF may not provide additional benefits when combined with other physical therapy interventions. There is low-quality evidence for ultrasound being more beneficial than placebo for calcific tendinitis. LLLT may have short-term benefits over placebo in rotator cuff disease.
Panni, 2000, Italy[519]	Observational – cohort	Patellar	Strengthening, flexibility	Palpation, pain on loading/activity, participant/patient rating overall condition	NA	After 6 months, 33 patients showed symptomatic improvement and were able to resume their sports. Nonoperative measures failed in 9 patients with stage 3 tendinopathy and surgery was performed. In the group treated nonoperatively, results were better in the patients who had stage 2 tendinopathy than in those with stage 3. Adequate nonoperative management should be attempted before deciding to undertake surgery.
Paoloni, 2004, Australia[520]	RCT	Achilles	Flexibility, strengthening	loading/activity, pain over a specified time, palpation, PFC, adverse effects/events,	NA	Topical glyceryl trinitrate significantly reduced pain with activity and at night, improved functional measures, and improved outcomes in patients with AT.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Park, 2010, Korea (Republic of)[521]	RCT	Lateral elbow	Strengthening	Pain without further specification, disability	NA	Isometric strengthening exercises done early in the course of LE (within 4 weeks) provide a clinically significant improvement.
Parle, 2017, Australia[522]	Pilot – randomised	Rotator cuff	Strengthening	further specification, disability, physical function	NA	This pilot cohort study showed preliminary results in favour of the effectiveness of both ice and isometric ER exercise in pain relief and better function.
Pasin, 2019, Turkey[523]	QE – with control (with pre-test)	Rotator cuff	Flexibility, strengthening	Pain on loading/activity, disability, QoL	NA	All three treatment modalities improved Quick DASH, UCLA shoulder rating scale, VAS at rest and during activity, and SF-36 pain subgroup scores in the treatment of SIS.
Payne (a), 2018, United Kingdom[524]	QE – with control (with pre-test)	Achilles	Strengthening	function capacity, ROM, structure, disability, pain without further specification	NA	After a 12-week eccentric exercise programme, measured variables in the pathological Achilles tendon did not reach parity with those in the non-affected tendon. VISA-A score, max AP diameter and Doppler score remained significantly different between the two tendon sides.
Payne (b), 2018, United Kingdom[524]	Observational – cohort	Achilles	NA	Pain without further specification, disability, structure	NA	The removal of the mechanical loading elicited by a 12-week eccentric exercise programme results in regression of both subjective and objective measures (VISA-A, SWE) within a symptomatic pathological Achilles tendon.
Pearson, 2012, New Zealand[525]	RCT	Achilles	Strengthening	Disability	Other	There is some evidence for small short-term symptomatic improvements with the addition of autologous blood injection to standard treatment for AT.
Pearson, 2018, Australia[526]	RCT – cluster	Patellar	Strengthening	Pain on loading/activity, Structure	NA	Pain was significantly reduced after isometric loading on both SLDS and hop tests. Pain and quadriceps function improved over the 4 weeks. Short-duration isometric contractions are found to be as effective as longer-duration contractions for relieving patellar tendon pain when total time under tension is equalised.
Pekyavas, 2016, Turkey[527]	RCT	Rotator cuff	Flexibility, strengthening	loading/activity, ROM, disability	NA	HILT and MT were found to be more effective in reducing pain and disability and improving ROM in patients with SAIS.
Penderghest, 1998, United States[528]	RCT	Rotator cuff, other – biceps and triceps, patellar	Strengthening, Flexibility	Pain without further specification, sensory modality specific pain	NA	Stretching, strengthening and cryothrerapy significantly decreased the levels of perceived pain associated with symptomatic tendinitis regardless of whether the subjects received phonophoresis.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Perez-Merino, 2016, Spain[529]	RCT	Rotator cuff	Strengthening, flexibility	Pain without further specification, disability	NA	Ultrasound, iontophoresis with dexketoprofen and phonophoresis with dexketoprofen can improve pain, shoulder function and physical functioning and symptoms in the upper limb in patients with SIS without a complete tear of the rotator cuff.
Petersen, 2007, Germany[530]	RCT	Achilles	Strengthening	Pain on loading/activity, disability, QoL, adverse effects/events	NA	The AirHeel brace is as effective as eccentric training in the treatment of chronic AT. There is no added benefit to combining both treatments.
Peterson, 2011, Sweden[531]	RCT	Lateral elbow	Strengthening	Pain on loading/activity	function capacity, disability, QoL	Exercise appears to be superior to the control group in reducing pain in chronic lateral epicondylosis.
Peterson, 2005, Sweden[532]	Survey	Lateral elbow	NA	NA	NA	A large number of treatment methods including ergonomic counselling, stretching, orthotic devices, TENS, acupuncture and dynamic exercises were reported in chronic epicondylitis, none of which is properly evidence-based and some of which are even known to be ineffective.
Peterson, 2014, Sweden[185]	RCT	Lateral elbow	Strengthening	Pain on loading/activity	PFC, disability, QoL	Eccentric graded exercise reduced pain and increased muscle strength in chronic tennis elbow more effectively than concentric graded exercise at follow-up. However, there were no significant differences in function or qua lity of life measures between the two groups.
Pienimaki, 1998, Finland[533]	RCT	Lateral elbow	Strengthening, flexibility	Participation, pain on loading/activity, other, disability	NA	Progressive exercise showed beneficial long-term effects at the 36-month follow-up compared to ultrasound treatment in terms of pain alleviation, working ability and the functional overall condition.
Pieters, 2020, Belgium[534]	Systematic reviews/secondary analysis	Rotator cuff	NA	NA	NA	There is a growing body of evidence to support exercise therapy as an intervention for subacromial shoulder pain.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Praet, 2019, Australia[535]	RCT – cross-over	Achilles	Strengthening, aerobic	Disability, structure, other, adverse effects/events	NA	Oral supplementation of specific collagen peptides may accelerate the clinical benefits of a well-structured calf-strengthening and return-to-running programme in patients with chronic AT.
Praet, 2018, Australia[130]	Pilot – randomised	Achilles	Strengthening, aerobic	Structure, participant/patient rating overall condition, participation, adverse	NA	Oral supplementation of specific collagen peptides may accelerate the clinical benefits of a well-structured calf-strengthening and return-to-running programme in AT patients.
Prat, 2018, Italy[536]	RCT	Lateral elbow	Strengthening	PFC, participa-tion, disability	NA	Eccentric exercise in combination with fascial manipulation appears to be more effective than exercise alone for reduc-ing pain and enhancing function in lateral elbow pain.
Pribicevic, 2005, Australia[537]	Observational – case series/reports	Rotator cuff	Strengthening	Pain without further specification, participation, ROM	NA	Case series demonstrate the potential benefit of a multimodal chiropractic protocol in resolving symptoms associated with a suspected clinical diagnosis of shoulder impingement syndrome.
Punnoose, 2015, United Kingdom[538]	Reviews/secondary analysis	Achilles, patellar	NA	NA	NA	ESWT did not show significant improvements in symptoms or pain compared to other treatments or control.
Purdam, 2004, Australia[539]	Pilot – non-randomised	Patellar	Strengthening	Pain on load-ing/activity, participation	NA	This pilot study indicates that an eccentric exercise pro-gramme using the decline squat is a potential treatment for subjects with chronically painful patellar tendinopathy.
Queiros da Silva, 2005, France[540]	Observational – cohort	Hamstring, quadriceps, achilles	Aerobic, strengthening, other, flexibility	PFC, participation	NA	This work enabled us to optimise the rehabilitation protocol for subacute muscle and tendon injuries of the lower limb using eccentric isokinetic work with a dynometer to improve healing.
Araya Quintanilla, 2012, Chile[541]	Systematic reviews/secondary analysis	Patellar	NA	NA	NA	Four studies were found. There is conflicting evidence that eccentric declined exercise is more effective than standard eccentric exercise in pain management and improved functionality in the short, medium and long term in patients with patellar tendinopathy.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Araya Quintanilla, 2015, Chile[542]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Exercise can be used either alone or alongside other therapeutic interventions to enhance strength and reduce pain in LE patients.
Rabello, 2018, Netherlands[543]	Systematic reviews/ secondary analysis	Achilles, patellar	NA	NA	NA	Improvements in clinical outcomes in tendinopathy seem to be associated with improved imaging outcomes, which supports the use of imaging as a complementary examination.
Radovanovic, 2019, Germany[544]	Pilot – non-randomised	Achilles	Strengthening	Disability, other	NA	VISA-A scores increased while plasma IL-6 levels decreased significantly after treatment. Patients with insertional did not significantly differ from patients with mid-portion AT. There were no differences between different types of intervention
Radpasand, 2009, United States[545]	Pilot – randomised	Lateral elbow	Strengthening	Disability, PFC, pain over a specified time	NA	Both multimodal programmes demonstrated changes in all of the outcomes. However, there was no information on feasibility and effect size to inform future RCT.
Ram, 2013, Canada[546]	QE – without control	Achilles	Strengthening	Participant/ patient rating overall condition	Pain on loading/ activity, disability, structure	Although patient-reported symptoms improved over time, eccentric training did not satisfy patient expectations following treatment despite compliance with home-based programmes.
Razavi, 2004, Sweden[547]	QE – with control (with pre-test)	Rotator cuff	Strengthening	Loading/activity, ROM, function, participant/ patient rating overall condition, medication	NA	Both groups increased range of movement; no difference was found between the effect of additional acupuncture treatment and placebo TENS in the treatment of rotator cuff tendinitis.
Resteghini, 2014, United Kingdom[548]	Pilot – randomised	Patellar	Strengthening	Pain without further specification, disability	NA	Both autologous blood injections and saline injections (plus eccentric exercise) had similar efficacy in those with recalcitrant PT.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Reyhan, 2020, Turkey[549]	RCT	Lateral elbow	Flexibility, strengthening	Loading/activity, pain over a specified time, disability, PFC, participant/patient rating	NA	MWM plus exercise and cold therapy is safe and effective at improving elbow pain, functional capacity and grip strength.
Riley, 2015, United States[550]	RCT	Rotator cuff	Strengthening	Disability	Loading/activity, pain over a specified time	Immediate and short-term improvements were observed from manipulation, irrespective of type.
Rio, 2015, Australia[551]	RCT – cross-over	Patellar	Strengthening	Pain on loading/activity, PFC	NA	Resistance training with isometric contractions reduced tendon pain immediately for at least 45 min post-intervention and increased maximal voluntary isometric contraction, whereby reduction in pain was paralleled by a reduction in cortical inhibition.
Rio, 2017, Australia[167]	RCT	Patellar	Strengthening	Pain on loading/activity	Disability	Both isometric and isotonic contraction protocols appear efficacious for in-season athletes to reduce pain; however, isometric contractions demonstrated significantly greater immediate analgesia throughout the 4-week trial.
Rio, 2019, Australia[167]	Observational – case series/reports	Patellar	Strengthening	Pain on loading/activity, disability	NA	A simple double-leg isometric squat exercise using a portable rigid belt significantly reduced patellar tendon pain in a real-world sporting environment across different sports.
Roe, 2000, Norway[552]	QE – without control	Rotator cuff	Other, flexibility, strengthening	PFC, pain on loading/activity	NA	Pain reduction after supervised exercises was associated with an improved maximal voluntary isometric contraction force, but the difference in maximal voluntary contraction force between the two sides was maintained. Muscle activity measured by EMG during maximal contraction increased in both the afflicted and unafflicted sides.
Roe, 2005, Norway[553]	RCT	Lateral elbow	Strengthening	PFC, pain over a specified time	NA	Supplementation with essential fatty acids appears to have no additional benefit in comparison to eccentric training alone.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Romero Morales, 2018, Spain[554]	RCT	Achilles	Strengthening	Structure	NA	The present study showed a RA thickness increase in both groups in favour of the EE vibration programme with respect to cryotherapy added to EE in short and mid term in maximal isometric contraction and at rest in subjects with chronic mid-portion AT. IRD was decreased in both groups without between-group differences.
Romero Morales, 2019, Spain[555]	RCT	Achilles	Strengthening	Structure	NA	Both an eccentric exercise vibration training programme and cryotherapy with eccentric exercise produced a thickness and cross-sectional area increase at 0, 2, 4 and 6 cm in maximal isometric contraction and at rest in subjects with chronic mid-portion AT. However, eccentric exercise vibration training showed a statistically greater cross-sectional area increase than the cryotherapy group.
Romero-Rodriguez, 2011, Spain[556]	Observational – case series/reports	Patellar	Strengthening, aerobic, flexibility	Function capacity, pain without further specification	NA	Short-term training using inertial eccentric overload resulted in improved muscle function and reduced subjective pain in long-lasting patellar tendinopathy.
Rompe, 2009, Germany[557]	QE – without control	Gluteal (including GTPS)	Flexibility, strengthening	Specified time, participant/patient rating overall condition	Adverse effects/even ts, medication use	The role of corticosteroid injection for greater trochanter pain syndrome needs to be reconsidered following positive results with radial shockwave therapy at 4 months.
Rompe, 2007, Germany[558]	RCT	Achilles	Strengthening	Participant/patient rating overall condition, pain over a specified time, sensory modality specific pain	NA	At 4-month follow-up, eccentric loading and low-energy SWT showed comparable results. The wait-and-see strategy was ineffective for the management of chronic recalcitrant AT.
Rompe, 2009, Germany[559]	RCT	Achilles	Strengthening	Participant/patient rating overall condition, pain over a specified time, medication	NA	The likelihood of recovery after 4 months was higher after a combined approach of both eccentric loading and SWT compared to eccentric loading alone.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Roos, 2004, Sweden[193]	RCT	Achilles	Strengthening	Disability, physical activity	NA	Eccentric exercises reduce pain and improve function in patients with AT.
Rosety-Rodriguez, 2006, Spain[560]	Control (with pre-test)	Patellar	Strengthening	Pain without further specification, participation	NA	Conservative treatment based on decline eccentric programmeshowed better results than standard squat programme.
Ross, 2018, Australia[561]	Systematic reviews/ secondary analysis	Posterior tibial tendon	NA	NA	NA	Local strengthening exercises provide some benefit in PTTD. Eccentric exercises maybe be superior to concentric in improving pain, disability and foot function outcomes.
Rowe (b), 2012, United Kingdom[11]	Qualitative	Achilles	NA	NA	NA	A number of themes were identified, including general perceptions of AT, and found strong evidence (eccentric exercise training, ESWT), moderate evidence (orthoses, low-level laser therapy, concentric exercises, splinting/bracing, active rest), conflicting/inconclusive evidence/no RCTs (TGTN, therapeutic ultrasound, taping, joint/soft tissue mobilisations, calf stretches).
Rowe (a), 2012, United Kingdom[11]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Eccentric loading exercises have the strongest supporting evidence of all the conservative treatment modalities, with strong evidence for ESWT.
Roy, 2009, Canada[562]	Observational – case series/ reports	Rotator cuff	Other, strengthening	Disability	Examination findings, PFC, pain on loading/activity	There is evidence to support the use of shoulder control exercises to reduce pain and improve function based on the SPADI in people with shoulder impingement.
Roy, 2010, Canada[563]	Observational – cohort	Rotator cuff	Other	further specification, physical function	NA	Unsupervised training appears to be a good complement to supervised training to normalise the kinematic impairments of people with SIS.
Saggini, 2012, Italy[564]	QE – without control	Patellar	Strengthening	further specification, disability, structure, participant/patient rating	NA	The addition of ESWT to classic vibration and eccentric training yielded significantly greater improvement in function and reduction in drug consumption than those without ESWT.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Saithna, 2012, United Kingdom[565]	Reviews/ secondary analysis	Patellar	NA	NA	NA	There is no high-quality evidence to support the withdrawal from sport in the management of patellar tendinopathy.
Sosa, 2014, Spain[566]	RCT	Patellar	Strengthening	Disability	NA	No significant differences after 4 weeks in either group.
Saltychev, 2015, Finland[567]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Moderate evidence suggests that surgical treatment is not more effective than active exercises on reducing pain intensity caused by shoulder impingement. However, evidence on the effectiveness of surgical or conservative treatment of shoulder impingement was found to be limited.
Sancho, 2019, Australia[178]	Observational – cohort	Achilles	Strengthening, aerobic	Other, adverse effects/events	Pain onloading/activity, psychological factors, participant/ patient rating overall condition, PFC	Addition of a pain-guided progressive hopping intervention to recommended education and exercise is feasible for recreational runners with AT.
Sanderson, 2015, Australia[568]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	There is limited evidence that prolotherapy injections are a safe and effective treatment for AT.
Sandford, 2018, United Kingdom[569]	RCT	Rotator cuff	Strengthening, other	Without further specification, QoL, function, participant/patient rating overall condition, ROM, physical	NA	The effect of omega−3 polyunsaturated fatty acid supplementation on disability and pain outcomes in people with rotator cuff-related shoulder pain is no greater than placebo.
Sandford, 2017, United Kingdom[157]	Qualitative	Rotator cuff	Other	NA	NA	The main enablers to exercise were highlighted as equipment, the perceived benefit from the actual exercises, incorporating exercise into an established routine, the longer follow-up, and more intensive monitoring and feedback received in the trial. Barriers included the lack of motivation, lack of suitable equipment, and pain, whether it was improving or worsening. Incorporating these enablers and addressing barriers may provide potential benefits.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Santamato, 2016, Italy[570]	RCT	Rotator cuff	Strengthening	Pain on loading/ activity, disability	PFC	In subjects with SAIS, combined administration of focussed ESWT and IE for the rotator cuff resulted in greater reduction of pain, as well as superior functional recovery and muscle endurance in the short to medium term, compared with ESWT alone.
Saracoglu, 2018, Turkey[571]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Clinical taping in addition to physiotherapy interventions (e.g. exercise, electro-therapy and MT) might be an optional modality for managing patients with shoulder impingement syndrome, especially for the initial stage of the treatment.
Satyendra, 2006, United States[572]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Eccentric exercise is an effective non-invasive treatment for patients suffering with AT.
Savoie, 2015, Canada[573]	QE – without control	Rotator cuff	Other, flexibility, strengthening	Disability	NA	The rehabilitation programme yielded improvements in symptoms (WORC) and functional limitations (DASH) in participants with SPS. Moreover, it led to an increase of the AHD, thus, potentially decreasing subacromial compression, particularly in participants with a smaller baseline AHD.
Say, 2016, Turkey[574]	Observational – cohort	Rotator cuff	Flexibility, strengthening	Without further specification, ROM	NA	Steroid injection was more effective than PRP injection for treatment of SIS in terms of the Constant score and VAS for pain at 6 weeks and 6 months.
Sayana, 2007, United Kingdom[575]	QE – without control	Achilles	Strengthening, flexibility	Disability	NA	Eccentric exercises, though effective in the majority of patients, may not benefit sedentary patients to the same extent reported in athletes.
Saylor-Pavkovich, 2016, United States[576]	Observational – case series/ reports	Rotator cuff	Strengthening	Disability, pain without further specification	NA	There is novel evidence to support the efficacy of combining both strength and dry needling as conservative treatment modalities.
Scott, 2019, Canada[577]	RCT	Patellar	Strengthening	Disability	Specified time, participant/ patient rating overall condition, medication use, other, adverse	Combined with an exercise-based rehabilitation programme, a single injection of leukocyte-rich PRP or leukocyte-poor PRP was no more effective than saline for the improvement of patellar tendinopathy symptoms.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Scott, 2015, Australia[578]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Weak evidence showed that an ankle joint dorsiflexion night splint was equally effective as a calf muscle eccentric exercise programme but strong evidence suggests that night splint was not beneficial when added to a calf muscle eccentric exercise programme. Similarly, moderate evidence showed that the AirHeel brace was as effective as a calf muscle eccentric exercise but this intervention was not beneficial when added to eccentric exercise. Findings suggest that calf muscle eccentric exercise, a relatively inexpensive intervention, should be used first in the management of mid-portion AT. These findings may also aid clinical decision-making in the context of AT, where an individualised treatment regime is required.
Seitz, 2019, United States[165]	Observational – case-control	Rotator cuff	Other, strengthening	PFC, disability	NA	A single exercise of prone horizontal abduction may be a viable treatment option in the short term in individuals with mild pain and functional loss due to rotator cuff-related shoulder pain, precipitating neuromuscular adaptations that carry over into a functional overhead lifting task.
Selvanetti, 2003, Italy[579]	RCT	Lateral elbow	Flexibility, strengthening	loading/activity, medication use, clinical examination findings, participant/ patient rating overall	NA	Eccentric exercise was more effective than placebo in reducing pain and improving function for lateral epicondylitis in the short term.
Sen, 2010, Turkey[580]	QE – with control (with pre-test)	Rotator cuff	Flexibility	On loading/ activity, pain over a specified time	NA	Balneotherapy can be safely applied for patients with SIS because it provides satisfactory results and improved QoL.
Şenbursa, 2007, Turkey[581]	RCT	Rotator cuff	Flexibility, strengthening	Pain without further specification, ROM, sensory modality specific pain, function	NA	The patients treated with manual physical therapy applied by experienced physical therapists combined with super vised exercise in a brief clinical trial showed improvement of symptoms including improved strength, pain and function earlier than with exercise programme.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Şenbursa, 2011, Turkey[582]	RCT	Rotator cuff	Other, flexibility, strengthening	Loading/activity, pain over a specified time, ROM, PFC, clinical examination	NA	Supervised exercise, supervised and MT, and home-based exercise are all effective and promising treatments for patients with subacromial impingement syndrome. The addition of an initial MT may improve outcomes with exercise.
Seven, 2017, Turkey[583]	RCT	Rotator cuff	Other, flexibility	Pain on loading/activity, disability, ROM, adverse effects/events	NA	Prolotherapy is an easily applicable treatment which may be superior in enhancing pain and function outcomes in comparison to exercise alone.
Sevier, 2015, United States[584]	RCT	Lateral elbow	Flexibility, strengthening	Disability	Pain on loading/activity, function, PFC	Astym therapy is an effective treatment option for patients with LE tendinopathy, as an initial treatment, and after an eccentric exercise programme has failed.
Shalabi, 2004, Sweden[585]	Observational – cohort	Achilles	Strengthening	Structure, disability	NA	The tendon volume and intratendinous signal decreased after 3 months of eccentric calf-muscle strength training. The reduced intratendinous signal correlated to diminished pain.
Shire, 2017, Denmark[586]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	There is insufficient evidence to support or refute the effectiveness of specific resistive exercise strategies in the rehabilitation of subacromial impingement syndrome.
Silbernagel, 2001, Sweden[587]	RCT	Achilles	Flexibility, strengthening	Activity, participation, medication use, other, participant/patient rating overall condition, ROM, pain on loading/activity, palpation,	NA	The eccentric overload protocol used in the present study can be recommended for patients with chronic pain from the Achilles tendon. More patients achieved full recovery, improved pain and ROM in the Exp group compared to the control group.
Silbernagel, 2007, Sweden[588]	QE – without control	Achilles	Strengthening	PFC	NA	Full symptomatic recovery in patients with AT does not ensure full recovery of muscle-tendon function

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Silbernagel, 2007, Sweden[138]	RCT	Achilles	Strengthening	Disability, pain on loading/activity	ROM, PFC	Our treatment protocol, which gradually increases the load on the Achilles tendon and calf muscle, demonstrated significant improvements. Continuing tendon loading activity such as running and jumping with the use of a pain-monitoring model did not have any adverse effect.
Silbernagel, 2011, United States[589]	Observational – case series/ reports	Achilles	NA	Disability, physical activity, psychological factors, PFC	NA	No significant differences in VISA-S scores were found between 1-year and 5-year follow-up for participants with continuous symptoms. Patients with new symptoms experienced a significant increase in VISA-S scores at 5-year follow-up compared to 1-year follow-up. Majority of participants recovered fully with exercise.
Simpson, 2011, United Kingdom[590]	Systematic reviews/ secondary analysis	Quadriceps	NA	NA	NA	There were no clear recommendations on how to specifically treat quadriceps tendinopathy, perhaps as it is less common.
Şimşek, 2013, Turkey[591]	RCT	Rotator cuff	Other	further specification, disability, ROM, physical function	NA	Findings were inconclusive and require further research.
Skovlund, 2020, Denmark[169]	Observational – case series/ reports	Patellar	Aerobic, strengthening	specified time, pain on loading/activity, structure, PFC, adverse effects/ events, participant/ patient	NA	Clinical and structural improvements in patellar tendon function were obtained after short-term (3 weeks), low-volume (9 sessions) low-load blood flow restriction training.
Smidt, 2002, Netherlands[592]	RCT	Lateral elbow	Flexibility, strengthening	Participant/patient rating overall condition, pain over a specified time, disability	PFC, sensory modality specific pain, participant/ patient rating overall condition	Injection showed better outcomes at 6 weeks. In the long term, physiotherapy had better results than the wait-and-see policy although differences were not significant.
Smidt, 2003, Netherlands[593]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	Insufficient evidence for exercises and mobilisation techniques, due to low power, poor validity and large heterogeneity.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Soderberg, 2012, Sweden[594]	RCT	Lateral elbow	Strengthening	PFC	Other, pain mover a specified time	Daily home eccentric exercise regimen is effective in increasing functional pain-free grip strength and reducing cases suffering from lateral epicondylalgia.
Solomons, 2020, Canada[595]	RCT	Achilles	Strengthening	Disability	Participant/patient rating overall condition, ROM, Structure	The addition of intramuscular stimulation to standard rehabilitation for AT did not result in any improvement over the expected clinical benefit achieved with exercise-based rehabilitation alone.
Stasinopoulos (a) *Chapter 3*, 2005, United Kingdom[596]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	There was strong evidence to suggest that physiotherapy, ultrasound, shockwave therapy and electromagnetic field therapy were ineffective for the treatment of lateral epicondylitis. A lack of evidence existed for the effectiveness of other modalities, exercise in particular.
Stasinopoulos (b) *Chapter 5*, 2005, United Kingdom[596]	Survey	Lateral elbow	NA	NA	NA	Clinicians appear to believe that Cyriax, supervised exercises and Bioptron treatments have the same treatment goals, but that exercise may be the least time-consuming and more logistically and financially feasible due to the ability to complete the sessions in a home environment.
Stasinopoulos, 2017, Cyprus[597]	RCT	Lateral elbow	Strengthening, flexibility	Pain over a specified time, function, PFC, drop-out or discontinued treatment	NA	Eccentric training, eccentric-concentric training and eccentric-concentric training combined with isometric contraction reduced pain and improved function at the end of the treatment and follow-up. The eccentric-concentric training combined with isometric contraction produced the largest effect at the end of the treatment and follow-up.
Stasinopoulos, 2004, Greece[598]	RCT	Patellar	Flexibility, strengthening	Participant/patient rating overall condition	NA	Exercise programme was a more effective treatment than ultrasound and transverse friction at the end of the treatment and at the follow-ups.
Stasinopoulos, 2006, Greece[599]	QE – with control (with pre-test)	Lateral elbow	Flexibility, strengthening	Pain over a specified time, function, PFC	NA	Cyriax physiotherapy, a supervised exercise programme, and polarised polychromatic non-coherent light reduced pain and improved function at the end of the treatment and at any of the follow-up time points. The supervised exercise programme produced the largest effect in the short, intermediate and long term.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Stasinopoulos, 2009, Greece[600]	QE – with control (with pre-test)	Lateral elbow	Flexibility, strengthening	specified time, PFC, drop-out or discontinued	NA	An exercise programme onsisting of eccentric and static stretching exercises, and LLLT or polarised polychromatic non-coherent light are both adequate treatme nt modalities for patients with LET.
Stasinopoulos, 2010, Greece[601]	QE – with control (with pre-test)	Lateral elbow	Flexibility, strengthening	Specified time, function, PFC	NA	Supervised exercise programme is superior to HEP to reduce pain and improve function in patients with LET at the end of the treatment and at the follow-up.
Stasinopoulos, 2013, Greece[331]	QE – with control (with pre-test)	Achilles	Strengthening, flexibility	Disability, drop-out or discontinued treatment	NA	Alfredson exercise protocol was superior to that of the Stanish model in improving pain and function in patients with AT.
Stasinopoulos, 2014, Cyprus[602]	Pilot – non-randomised	Rotator cuff	Flexibility, strengthening	Pain over a specified time, drop-out or discontinued treatment	NA	Exercise programme, consisting of isotonic strengthening, including eccentric, and static stretching exercises, reduced the pain in patients with rotator cuff tend inopathy at the end of the treatment and 3 months after the end of treatment.
Stefansson, 2019, Iceland[184]	RCT	Achilles	Strengthening	Disability, sensory modality specific pain, ROM, structure	NA	Pressure massage is a useful treatment for AT. Compared with eccentric exercise treatment, pressure massage similarly improved VISA-A scores and ankle ROM. Combining the treatments did not further improve the outcome.
Stephens, 2019, United Kingdom[158]	Survey	Gluteal (including GTPS)	Flexibility, strengthening, other	NA	NA	This large survey highlights that physiotherapists in the UK most commonly use education on load management and self-management strategies, alongside strengthening exercises targeting the hip abductors for patients with GTPS.
Stergioulas, 2007, Greece[603]	RCT	Lateral elbow	Strengthening, flexibility	loading/activity, pain – clinician-applied stress/ examination, ROM	NA	Combination of laser along with plyometric exercises and stretching is more effective than placebo laser and exercise in the treatment of patients with LE

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Stergioulas, 2008, Norway[604]	RCT	Achilles	Strengthening, flexibility	Pain on loading/ activity	Other, ROM, palpation	Low-level laser therapy with the parameters used in this trial seems to be a safe and effective method for more rapid recovery when combined with an eccentric exercise regimen. It is emphasised that using power densities below 100 mW/cm^2 seem to be important for good outcomes.
Steunebrink, 2013, Netherlands[605]	RCT	Patellar	Strengthening	Disability	Patient rating overall condition, pain on loading/ activity, adverse effects/even ts, medication use,	Continuous topical GTN treatment in addition to an eccentric exercise programme does not improve clinical outcome compared to placebo patches and an eccentric exercise programme in patients with chronic patellar tendinopathy.
Steuri, 2017, Switzerland[606]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Although there was only very low-quality evidence, exercise should be considered for patients with shoulder impingement symptoms and tape, ECSWT, laser or MT might be added. NSAIDS and corticosteroids are superior to placebo, but it is unclear how th ese treatments compare to exercise.
Stevens, 2014, United Kingdom[175]	RCT	Achilles	Strengthening	Disability	Pain without further specification, adverse effects/events	Performing a 6-week do-as-tolerated programme of eccentric heel-drop exercises compared to the recommended 180 repetitions per day did not lead to lesser improvement for individuals with midportion AT, based on VISA-A and VAS scores.
Struijs, 2003, Netherlands[607]	Pilot – Randomised	Lateral elbow	Flexibility, strengthening	Participant/ patient rating overall condition	Clinician applied stress/examination, pain over a specified time, disability, physical	The cohort study provided preliminary results in favour of manipulation of the wrist over ultrasound, friction massage, stretching, and strengthening exercises for the management of lateral epicondylitis in short follow-up.
Struijs, 2004, Netherlands[608]	RCT	Lateral elbow	Flexibility, strengthening	Participant/ patient rating overall condition, other, pain without further specification, disability	patient rating overall condition, PFC, Pain – clinician-applied stress/ examination	Conflicting results were found. Brace treatment might be useful as initial therapy. Combination therapy has no additional advantage compared to physical therapy but is superior to brace only for the short term (6 weeks).
Struijs, 2006, Netherlands[609]	RCT	Lateral elbow	NA	Economic impact costs	NA	No clinically relevant or statistically significant differences in costs were identified between the three strategies.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Struyf, 2013, Belgium[610]	RCT	Rotator cuff	Other, flexibility	Disability	Examination findings, Pain on loading/activity, ROM, PFC	A rehabilitation programme that included motor control exercises, scapular mobilisations and stretching is effective for reducing pain and disability for patients with shoulder impingement syndrome.
Subasi, 2012, Turkey[611]	RCT	Rotator cuff	Strengthening, flexibility	Pain without further specification, ROM, disability	NA	Both groups of exercise combined with conservative physical therapy modalities produce favourable results for pain and function. However, water-based activities may confer superior benefits.
Subasi, 2016, Turkey[612]	QE – with control (with pre-test)	Rotator cuff	Flexibility, strengthening	Pain on loading/activity, ROM, disability	NA	Both kinesiological taping and steroid injection in conjunction with an exercise programme can be beneficial in the rehabilitation of SIS. Kinesiological taping can be considered a safe and inexpensive alternative for SIS especially for patients who have anxiety problems about injections or for whom steroid injections are contraindicated.
Sussmilch-Leitch, 2012, Australia[613]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Practitioners can consider eccentric exercise as an initial intervention for AT, with the addition of laser therapy as appropriate. Shockwave therapy may represent an effective alternative.
Svernlov (a), 2001, Sweden[614]	Pilot – randomised	Lateral elbow	Flexibility	Applied stress/ examination, pain without further specification, participation, physical	NA	Significant improvements observed for VAS and grip strength warrants clinical use of this regime.
Svernlov (b), 2001, Sweden[614]	QE – with control (with pre-test)	Lateral elbow	Strengthening, flexibility	Applied stress/ examination, pain without further specification, participation, physical	NA	Significant improvements seen in pain and grip strength following eccentric training regime in a majority of patients with lateral humeral epicondylagia, regardless of duration, and it is possibly superior to conventional stretching.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results *(continued)*

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Sweeting, 2011, Australia[615]	Survey	Achilles	NA	NA	NA	Exercise is preferred as the primary mode of treatment in patients with AT as patients preferred exercise treatment as a standalone option which cost less, had a greater chance of success and allowed for an earlier return to pain-free activity.
Syvertson, 2017, United States[616]	Observational – case series/reports	Achilles	Strengthening	Specified time, disability, participant/patient rating overall condition	NA	This exploratory case series showed promising short-term clinical results with a small group of participants diagnosed with AT.
Szczurko, 2009, Canada[617]	RCT	Rotator cuff	Flexibility, strengthening	Disability	QoL, pain without further specification, other, ROM	Both naturopathic and standardised physical exercise groups provided significant improvements in shoulder function, with greater improvement in favour of the naturopathic group. Statistically significant improvements in QoL measures were also observed in the naturopathic group compared to the physical exercise group.
Tahran, 2020, Turkey[618]	RCT	Rotator cuff	Other, flexibility, strengthening	Pain on loading/activity, disability, ROM	NA	All treatments improved pain, shoulder mobility, function and disability in patients with SIS. However, modified posterior shoulder stretching exercises in addition to a treatment programme was superior to the treatment programme alone in improving pain with activity, internal rotation ROM and dysfunction. Moreover, stretching provided clinically significant improvements.
Taskaynatan, 2007, Turkey[619]	QE – with control (with pre-test)	Other – bicipital tendonitis	Flexibility, strengthening	Loading/activity, disability, ROM, participant/patient rating overall	NA	Treatment modalities targeting biceps tendon pathologies; isolated or accompanying other shoulder pathologies, may increase the improvement.
Taunton, 2004, Canada[620]	RCT	Achilles	Strengthening	Function capacity, disability, structure, participant/patient rating	NA	Significant improvements on pain levels, function and return to activity were observed in the Exp group despite no improvement in calf muscle strength.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Thanasas, 2011, Greece[62]	RCT	Lateral elbow	Flexibility, strengthening	Pain without further specification, function	NA	PRP treatment seems to effectively reduce pain in chronic lateral elbow epicondylitis and is superior to autologous blood in the short term.
Thijs, 2017, Netherlands[621]	RCT	Patellar	Strengthening	Disability	Loading/activity, participant/patient rating overall condition, adverse effects/even	There was no additional effect of 3 sessions ESWT in participants with PT treated with eccentric exercises as no significant differences for primary and secondary outcomes were found.
Thompson, 2019, New Zealand[622]	RCT	Gluteal (including GTPS)	Strengthening	further specification, disability	Other, medication use	A single injection of PRP resulted in no significant improvement for GTPS compared with a placebo injection.
Tonks, 2012, United Kingdom[623]	RCT	Lateral elbow	Strengthening, flexibility	Other	Loading/activity, disability, PFC,	In the short term, the injection group showed superior effectiveness, whereas exercise is more effective for long-term management of tennis elbow.
Tonks, 2007, United Kingdom[624]	RCT	Lateral elbow	Flexibility, strengthening	PFC	Disability, adverse effects/even ts, PFC	Steroid injection alone is advocated as the first-line of treatment for patients presenting with tennis elbow following significant improvements when compared to physiotherapy.
Townsend, 2020, United States[625]	Systematic reviews/ secondary analysis	Achilles, rotator cuff, lateral elbow	NA	NA	NA	The clinical effectiveness of PRP remains controversial and there is limited evidence on the effect of post-PRP protocols with substantial heterogeneity in protocols.
Trampas, 2006, Greece[626]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	Limited data suggest that manual and exercise therapy may be more effective than other interventions for managing shoulder impingement syndrome, although methodological quality is low.
Trudel, 2004, Canada[627]	Systematic reviews/ secondary analysis	Lateral elbow	NA	NA	NA	This review has determined, with at least level 2b evidence, that a number of treatments, including acupuncture, exercise therapy, manipulations and mobilisations, ultrasound, phonophoresis, Rebox, and ionisation with diclofenac all show positive effects in the reduction of pain or improvement in function for patients with lateral epicondylitis. There is also at least level 2b evidence showing laser therapy and pulsed electromag netic field therapy to be ineffective.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Tsehaie, 2017, Netherlands[628]	Observational – cohort	Achilles	Strengthening	Disability	Structure	Tendon volume and CSA decreased significantly after 24 weeks of conservative treatment. As these differences were within the MDC limits, they could be a result of a measurement error. Furthermore, MRI parameters at baseline did not predict the change in symptoms, and therefore have no added value in providing a prognosis in daily clinical practice.
Tumilty, 2008, New Zealand[629]	Pilot – feasibility	Achilles	Strengthening	Disability	Specified time, PFC	This pilot study demonstrated the feasibility of a RCT to assess the effect of LLLT in AT.
Tumilty, 2012, New Zealand[630]	RCT	Achilles	Strengthening	Disability	Pain over a specified time	No evidence for clinical effectiveness of adding LLLT to eccentric exercises for the treatment of AT.
Tumilty, 2015, New Zealand[631]	RCT – cross-over	Achilles	Strengthening	Disability	NA	The Alfredson protocol of heavy-load eccentric exercise for AT provide no extra benefit over exercises performed twice per week for 12 weeks. Four weeks of low-level laser th erapy as an adjunct to an eccentric exercise regime of two sessions per week provide superior results compared to exercise alone.
Tumilty, 2016, New Zealand[632]	RCT	Achilles	Strengthening	Disability	Pain without further specification, structure	The group receiving laser as an adjunct to exercise regime 2 improved significantly more than all other groups.
Turgut, 2017, Turkey[633]	RCT	Rotator cuff	Flexibility, strengthening, other	ROM, disability, pain on loading/activity, pain over a specified time	NA	Progressive exercise training independent from specific scapular stabilisation exercises provides decreased disability and pain severity in impingement syndrome. All groups showed improvement; however, there were no significant differences between the groups.
Turgut, 2018, Turkey[634]	Observational – cohort	Rotator cuff	Flexibility	Examination findings, pain on loading/activity, pain over a specified time,	NA	Six-week stretching programme resulted in increased flexibility and decreased pain and disability in participants with SI.
Turgut, 2018, Turkey[635]	QE – without control	Rotator cuff	Flexibility, other	Disability	NA	Pain and disability gains can be achieved with 6-week progressive exercise training for participants with rotator cuff tendinopathy.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Tyler, 2010, United States[636]	RCT	Lateral elbow	Flexibility, strengthening	On loading/activity, PFC, sensory	NA	All outcome measures for chronic lateral epicondylosis were markedly improved with the addition of an eccentric wrist extensor exercise to standard physical therapy through the novel use of an inexpensive rubber bar.
Valera-Garrido, 2014, Spain[637]	QE – without control	Lateral elbow	Flexibility, strengthening	Loading/activity, sensory modality specific pain, pain – clinician-applied stress/examination	NA	Symptoms and degenerative structural changes of chronic lateral epicondylitis are reduced after US-guided PNE associated with eccentric exercises and stretching,
Valles-Carrascosa, 2018, Spain[638]	RCT	Rotator cuff	Strengthening, other, flexibility	Pain on loading/activity, ROM	Disability	Both rotator cuff eccentric exercise protocols with scapular stabilising and stretching of upper trapezius were equally effective in improving pain, function and active ROM in the short term in patients with subacromial syndrome.
Vander Doelen, 2020, Canada[639]	Systematic reviews/secondary analysis	Patellar	NA	NA	NA	Nine RCTs fitted the inclusion criteria. Isometric exercise, patellar strapping, sports taping, eccentric exercise, injections with PRP, ABI and saline and DN demonstrated a short-term pain relieving and functional improvement effect in subjects with patellar tendinopathy. Longer-term follow-up on interventions involving eccentric exercise, DN and injections with PRP, ABI and saline showed sustained pain reduction and improvement in knee function.
van der Worp, 2014, Netherlands[640]	RCT	Patellar	Strengthening	Disability	Pain on loading/activity, participant/patient rating overall condition	There is no difference between focused and radial shock-wave therapy for chronic patellar tendinopathy in addition to eccentric training. Both treatment groups showed a slight improvement after treatment and it is impossible to recommend one ESWT treatment over the other in terms of effectiveness.
Verrall, 2011, Australia[149]	Observational – case-control	Achilles	Flexibility	Pain on loading/activity	NA	A modified 6-week eccentric heel-drop training regimen as the only treatment for chronic AT resulted in a high degree of patient satisfaction, reduced pain and a successful return to pre-morbid activity levels. These results were best for mid-substance rather than insertional tendinopathy.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Vinuesa-Montoya, 2017, Spain[641]	RCT	Rotator cuff	Flexibility, strengthening	Further specification, disability, clinical examination	NA	Cervicothoracic manipulative treatment with mobilisation plus exercise therapy may improve intensity of pain and ROM compared with home exercise alone.
Virta, 2009, Sweden[642]	Observational – cohort	Rotator cuff	Strengthening, other	Disability	NA	Supervised exercise should be the first treatment option for patients with SIS.
Visnes, 2005, Norway[129]	RCT	Patellar, quadriceps	Strengthening	Disability	Participant/patient rating overall condition, PFC	There was no effect on knee function (VISA) from a 12-week programme with eccentric training among a group of volleyball players with patellar tendinopathy who continued to train and compete during the treatment period. Whether the training would be effective if the patients did not participate in sports activity is not known.
von Wehren, 2019, Switzerland[643]	Observational – cohort	Achilles	Strengthening	Disability, structure	NA	Both therapies led to improvement of MRI findings, including reduction of tendon thickness and tendon quality. Autologous conditioned serum injections show greater clinical long-term benefit as compared to eccentric training and, therefore, offer a good alternative to eccentric training.
van Ark, 2013, Netherlands[170]	Observational – case series/reports	Patellar	Strengthening, aerobic, flexibility	Disability	Loading/activity, PFC, adverse effects/events, medication	The combination treatment which includes a physical programme after PRP injection reported in this study is feasible and seems to be promising for patients in the late/degenerative phase of patellar tendinopathy.
van Ark, 2016, Australia[644]	RCT	Patellar	Strengthening	Pain on loading/activity	Disability, participant/patient rating overall condition	This study found favourable results for athletes with patellar tendinopathy without modification of the training. Both isometric and isotonic exercise programmes reduced pain and improved function in athletes with patellar tendinopathy during a season.
van Ark, 2018, Netherlands[645]	RCT	Patellar	Strengthening	Structure, pain on loading/activity, pain over a specified time, disability	NA	Structural properties and dimensions of the patellar tendon on UTC did not change after a 4-wk isometric or isotonic exercise programme for athletes with patellar tendinopathy, despite an improvement in symptoms. It seems that structural improvements are not required for a positive clinical outcome.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
van der Plas, 2012, Netherlands[105]	RCT	Achilles	Strengthening	Disability	Participant/ patient rating overall condition, pain without further specifica-tion, other	At 5-year follow-up, a significant increase of VISA-A score can be expected. After the 3-month Alfredson's heel-drop exercise programme, almost half of the patients had received other therapies. Although improvement of symptoms can be expected at long term, mild pain may remain.
Vlist, 2020, Netherlands[646]	Control (with pre-test)	Achilles	Strengthening	Pain on loading/ activity	PFC	Isometric and isotonic exercises do not result in immediate pain relief in patients with mid-portion AT.
van der Vlist, 2020, Netherlands[141]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	NMA of 29 RCTs concluded that active treatments (exercise therapy, acupuncture, exercise + shockwave, mucopolysac-charides + exercise therapy, exercise + injection and exercise + night splint) are superior to wait-and-see. However, there was no clear difference between active treatment modalities at either 3- or 12-month follow-up.
Van Rijn, 2019, Netherlands[647]	Systematic reviews/ secondary analysis	Patellar	NA	NA	NA	Exercise, eccentric training in particular, is important in the management of PT. The role of ESWT remains uncertain.
van Usen, 2007, Australia[648]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	12 studies were included. The best options for managing Achilles tendinosis were medication and eccentric exercises. Eccentric exercises are simple to perform and provide a cost-effective, safe and efficient treatment option. They should be considered first for all patients, before invasive interventions such as surgery and drug therapy.
Vuvan, 2020, Australia[187]	RCT	Lateral elbow	Strengthening	Disability, participant/ patient rating overall condition, PFC	Pain over a specified time, sensory modality specific pain	Unsupervised isometric exercise was effective in improving pain and disability, but not perceived rating of change and pain-free grip strength when compared with wait-and-see at 8 wk. With only one of the three primary outcomes being significantly improved, it is doubtful if isometric exercises can be an efficacious standalone treatment.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Walsh, 2015, Ireland[649]	NR	Rotator cuff	Strengthening	Disability	NA	Exercise classes produced similar or better outcomes in terms of pain, physical measurement and function compared to individual instruction. The implications for time management and efficiency make the class model an attractive and effective method for the management of rotator cuff impingement syndrome.
Wang, 2007, Taiwan[650]	RCT	Patellar	Strengthening	Loading/activity, palpation, disability, medication use, other, structure	NA	ESWT appeared to be more effective and safer with lower symptom recurrence than traditional conservative treatments in the management of patients with chronic patellar tendinopathy.
Wang, 2014, Hong Kong, China (SAR)[651]	Systematic reviews/ secondary analysis	Rotator cuff	NA	NA	NA	There is currently not enough evidence available to support or refute the effectiveness of isokinetic training for SIS. This does not reflect a true lack of effect, but rather a lack of RCTs in this area.
Warden, 2008, United States[652]	RCT	Patellar	Strengthening	Pain on loading/ activity	Disability, participant/ patient rating overall condition, adverse effects/ events, other	Low-intensity pulsed ultrasound does not provide any additional benefit over and beyond placebo in the management of patellar tendinopathy.
Wasielewski, 2007, United States[653]	Systematic reviews/ secondary analysis	Achilles, patellar	NA	NA	NA	Eccentric exercise is an effective form of treatment for tendinopathies of the lower limb; however, limited evidence exists to support its superiority over other forms of therapeutic treatment.
Dragoo, 2014, United States[336]	RCT	Patellar	Strengthening, flexibility, aerobic	Disability	Pain without further specification, disability, QoL	The addition of a US-guided leukocyte-rich PRP injection improved significantly more than dry needling group in VISA at 12 weeks, but differences were not significant at 26 weeks.
Wegener, 2015, Australia[654]	Observational – case series/ reports	Lateral elbow	Strengthening	further specification, physical function	NA	The use of elastic therapeutic tape in conjunction with eccentric exercises may be clinically beneficial in the treatment of lateral elbow tendinosis.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Wegener, 2016, Australia[655]	RCT	Lateral elbow	Flexibility, strengthening	Disability, PFC	QoL, participation	Whilst all groups improved on key outcomes, it is possible that exercise alone and/or natural recovery were responsible for improvements.
Weir, 2011, Netherlands[656]	RCT	Other – adductor-related groin pain	Strengthening, other	ROM, pain – clinician-applied stress/examination	NA	The multi-modal programme resulted in a significantly quicker return to sports than exercise therapy plus return to running but neither treatment was very effective.
Wen, 2011, United States[657]	RCT	Lateral elbow	Strengthening	Pain without further specification	Pain without further specification	The authors were unable to show any statistical advantage to eccentric exercises for lateral epicondylosis compared with local modalities and stretching exercises.
Werner, 2002, Germany[658]	RCT	Rotator cuff	Flexibility, strengthening	Participant/patient rating overall condition, disability	NA	Strengthening of the centering muscles around the humeral head led to positive outcomes for subacromial impingement. Self training after instruction showed no difference from physiotherapist-supervised exercises.
Wesner (a), 2016, Canada[659]	Pilot – feasibility	Rotator cuff	NR	Pain without further specification, disability, participation	NA	Preliminary results indicate intratendinous, ultrasound-guided PRP injection may lead to improvements in pain, function and MRI-documented tendon pathology.
Wesner(b), 2016, Canada[659]	Observational – cohort	Achilles, patellar, lateral elbow, rotator cuff	NR	Pain without further specification, participation	NA	Preliminary results indicate intratendinous, ultrasound-guided PRP injection may lead to improvements in pain, function and MRI-documented tendon pathology.
Wetke, 2015, Denmark[660]	QE – without control	Achilles	Strengthening, flexibility, aerobic	Pain on loading/activity, participant/patient rating overall condition	Pain over a specified time, other, pain – clinician-applied stress/examination	We evaluated the effectiveness of a training protocol and found that only a minority succeeded with exercises alone.
Whalley, 2019, United States[661]	Observational – cohort	Lateral elbow	NR	Disability, pain without further specification	NA	Education-based self-management improved pain, function, and helped individuals with LET return to work sports and daily activities

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Wheeler, 2019, United Kingdom[662]	Observational – case series/ reports	Achilles	Flexibility, strengthening, other	Pain without further specification	Function, QoL, psychological factors, physical	Improvements in multiple outcomes were observed in patients with insertional and non-insertional AT following a combination of ESWT and home rehabilitation.
Wheeler, 2020, United Kingdom[663]	Observational – cohort	Achilles	Flexibility, strengthening	further specification, other,	NA	ESWT and HVIGI are both effective treatments for recalcitrant AT.
Wiedmann, 2017, Germany[664]	RCT	Achilles	Strengthening	Structure, pain without further specification, physical	NA	Eccentric training improved the VISA-A and VAS scores after 12 weeks more than physiotherapy treatment.
Wiegerinck, 2013, Netherlands[665]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	ESWT seems effective in patients with non-calcified insertional AT. There was mixed support for eccentric exercises and not possible to draw conclusions regarding surgical treatments.
Wiener, 2005, Germany[666]	RCT	Rotator cuff	Flexibility, strengthening	Further specification, PFC	NA	Although physiotherapy helps to build up the muscular strength of the rotator cuff, the influence on pain remains essential to improve weakness in painful movements and hence should be given more attention.
Wilson, 2000, United States[667]	RCT	Patellar	Flexibility, strengthening	disability, other	NA	Findings suggest that ASTM advantage resulted in improved clinical outcomes in treating patellar tendinitis.
Wilson, 2018, Ireland[668]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Exercise can be recommended for AT to reduce pain and improved function and QoL compared to non-exercise, placebo or advice to rest. However, the optimal mode of exercise remains unclear.
Woodley, 2007, New Zealand[669]	Systematic reviews/ secondary analysis	Achilles, lateral elbow, patellar	NA	NA	NA	There is a lack of high-quality research to support the clinical effectiveness of eccentric exercise over other treatments in the management of tendi nopathies.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Worsley, 2013, United Kingdom[26]	Observational – case series/ reports	Rotator cuff	Other	Disability	Pain without further specification, PFC,	The 10-week motor control intervention for shoulder impingement increased function and reduced pain. Recovery mechanisms were indicated by changes in muscle recruitment and scapular kinematics.
Wright, 2017, United Kingdom[670]	Pilot – randomised	Rotator cuff	Flexibility, other, strengthening	Disability, pain over a specified time	Psychological factors, ROM, PFC	The addition of cervicothoracic spinal thrust/non-thrust to the shoulder treatment only group did not significantly alter improvement in pain or function in patients with subacromial pathology. Both approaches appeared to provide an equally notable benefit on all outcomes and met the criteria for clinical relevance for both pain and function.
Yazmalar, 2016, Turkey[671]	RCT	Rotator cuff	Flexibility, strengthening	Disability, psychological factors, other, QoL	NA	TENS and exercise are effective on pain, disability, and sleep disturbance but may not be effective on other psychosocial measures like anxiety, depression and fatigue in patients with SIS.
Yeldan, 2009, Turkey[672]	QE – with control (with pre-test)	Rotator cuff	Flexibility, strengthening	Loading/activity, pain over a specified time, disability, PFC, ROM	NA	No significant difference between LLLT and placebo LLLT when they are supplementing an exercise programme for treatment of shoulder impingement syndrome.
Yelland, 2019, Australia[673]	RCT	Lateral elbow	Other, strengthening	Disability, participant/ patient rating overall condition	Loading/activity, pain over a specified time, QoL, PFC	No significant differences amongst the physiotherapy, prolotherapy and combined groups in PRTEE and global impression of change measures over a year.
Yelland, 2011, Australia[674]	RCT	Achilles	Strengthening	Disability	Participant/ patient rating overall condition, pain over a specified time	Prolotherapy and particularly eccentric loading exercises combined with prolotherapy gave more rapid improvements in Achilles tendinosis symptoms than eccentric loading exercises alone. Long-term VISA-A scores were similar.

continued

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Yerlikaya, 2018, Turkey[675]	QE – with control (with pre-test)	Lateral elbow	Flexibility, strengthening	Further specification, PFC, structure, adverse	NA	Lateral epicondylitis does not seem to be affected by either leukocyte-rich PRP or leukocyte-poor PRP on pain and function in the short term.
Yildirim, 2013, Turkey[676]	RCT	Rotator cuff	Flexibility, strengthening	On loading/ activity, pain over a specified time, psychologi- cal factors	NA	Nine minutes of ultrasound administration was more effective than 4 minutes at relieving pain and improving functionality.
Yilmaz, 2015, Turkey[677]	Observational – cohort	Rotator cuff	Strengthening	patient rating overall condition, pain on loading/ activity, pain over a specified time, disability,	NA	A specific conservative treatment programme is highly effective in improving pain, disability and hand grip strength in shoulder subacromial pain problems.
Young, 2002, Australia[678]	RCT	Patellar	Strengthening	On loading/ activity, physical function	NA	Both exercise programmes positively affected pain, function and strength.
Young, 2005, Australia[132]	RCT	Patellar	Strengthening	Disability	Clinician-applied stress/exami nation, pain over a specified time	Both exercise protocols improved pain and sporting function in volleyball players over 12 months. The decline squat protocol offers greater clinical gains during a rehabilitation programme for patellar tendinopathy in athletes who continue to train and play with pain.
Young, 2017, United States[679]	Systematic reviews/ secondary analysis	Achilles	NA	NA	NA	Session duration, frequency, total number of visits, and overall length of care may all be dosing variables with limited value for determining effective exercise prescrip- tion. However, the limited number of studies prevents any definitive conclusions.

TABLE 33 Table of studies included in scoping review: characteristics and results (*continued*)

Study details (first author, year, country)	Study type	Tendinopathy type	Exercise type	Primary ICON domain	Secondary ICON domain	Summary
Young, 2018, United States[22]	Reviews/secondary analysis	Patellar	NA	NA	NA	Optimal dosing is still unclear for patellar tendinopathy as no trends were observed with exercise dosing.
Yu, 2013, Korea (Republic of)[680]	QE – with control (with pre-test)	Achilles	Strengthening, aerobic	Further specification, physical function	NA	Eccentric strengthening was more effective than concentric strengthening in reducing pain and improving function in patients with AT.
Yu, 2016, Canada[681]	Systematic reviews/secondary analysis	Achilles	NA	NA	NA	Evidence suggests that patients with persistent midportion AT may benefit from shockwave therapy. However, the current evidence does not support the use of splints. There was high risk of bias in the RCTs included in this study.
Yuksel, 2015, Turkey[682]	RCT	Rotator cuff	Other, strengthening, flexibility	Pain without further specification, PFC, clinical examination findings, disability	NA	The addition of scapular stability exercises had added benefit to traditional treatment modalities and is recommended for patients with scapular dyskinesis.
Yuruk, 2016, Turkey[683]	RCT	Lateral elbow	Flexibility, strengthening	Pain on loading/activity, physical function	NA	The addition of shockwave to exercise is more effective than placebo shockwave with exercise.

Appendix 3 Citation analysis

```
##                               Description   Results
## 2                                Timespan 1998:2021
## 3        Sources (Journals, Books, etc)       164
## 4                               Documents       450
## 5        Average years from publication      8.65
## 6       Average citations per documents     46.62
## 7    Average citations per year per doc     4.106
## 8                              References     14860
## 9                          DOCUMENT TYPES
## 10                                article       377
## 11                       conference paper         1
## 12                                   note         1
## 13                                 review        71
## 14                      DOCUMENT CONTENTS
## 15                      Keywords Plus (ID)      1574
## 16                  Author's Keywords (DE)       584
## 17                                AUTHORS
## 18                                Authors      1613
## 19                     Author Appearances      2180
## 20 Authors of single-authored documents          5
## 21  Authors of multi-authored documents       1608
## 22                  AUTHORS COLLABORATION
## 23               Single-authored documents         5
## 24                    Documents per Author     0.279
## 25                    Authors per Document      3.58
## 26                 Co-Authors per Documents      4.84
## 27                     Collaboration Index      3.61
## 28
```

Most productive authors in collection

```
##     Authors        Articles  Authors        Articles Fractionalized
## 1     ROY JS              12 ALFREDSON H                       3.23
## 2     ALFREDSON H         11 MAFFULLI N                        2.53
## 3     DE VOS RJ           11 ROY JS                            2.27
## 4     MAFFULLI N          10 STASINOPOULOS D                   2.25
## 5     MALLIARAS P         10 LITTLEWOOD C                      2.14
## 6     VERHAAR JAN         10 VICENZINO B                       2.09
## 7     VICENZINO B         10 LORENTZON R                       2.08
## 8     WEIR A              10 MALLIARAS P                       2.06
## 9     LITTLEWOOD C         9 DE VOS RJ                         1.96
## 10    TOL JL               9 LANGBERG H                        1.88
## 11    ZWERVER J            9 BALTACI G                         1.83
## 12    COOK J               8 JONSSON P                         1.78
## 13    DESMEULES F          8 STASINOPOULOS I                   1.75
## 14    FRMONT P             8 VERHAAR JAN                       1.71
## 15    LANGBERG H           8 WEIR A                            1.69
## 16    CLELAND JA           7 CLELAND JA                        1.65
## 17    LORENTZON R          7 TOL JL                            1.53
## 18    MORRISSEY D          7 ZWERVER J                         1.51
## 19    BALTACI G            6 WHEELER PC                        1.50
## 20    BISSET L             6 COOK J                            1.44
```

* Articles fractionalized represents a summation of the number of articles divided by the number of coauthors

Most common sources in collection

```
##                                                  Sources        Articles
## 1  BRITISH JOURNAL OF SPORTS MEDICINE                                 39
## 2  AMERICAN JOURNAL OF SPORTS MEDICINE                                28
## 3  JOURNAL OF ORTHOPAEDIC AND SPORTS PHYSICAL THERAPY                 15
## 4  CLINICAL JOURNAL OF SPORT MEDICINE                                 14
## 5  KNEE SURGERY SPORTS TRAUMATOLOGY ARTHROSCOPY                       14
## 6  CLINICAL REHABILITATION                                            11
## 7  SCANDINAVIAN JOURNAL OF MEDICINE AND SCIENCE IN SPORTS             11
## 8  JOURNAL OF HAND THERAPY                                             8
## 9  MANUAL THERAPY                                                      8
## 10 PHYSICAL THERAPY IN SPORT                                           8
## 11 PHYSIOTHERAPY (UNITED KINGDOM)                                      8
## 12 FOOT AND ANKLE INTERNATIONAL                                        7
## 13 JOURNAL OF SPORT REHABILITATION                                     7
## 14 PHYSICAL THERAPY                                                    7
## 15 ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION                    6
## 16 BMJ OPEN SPORT AND EXERCISE MEDICINE                                6
## 17 EUROPEAN JOURNAL OF PHYSICAL AND REHABILITATION MEDICINE            6
## 18 JOURNAL OF BACK AND MUSCULOSKELETAL REHABILITATION                  6
## 19 JOURNAL OF MANIPULATIVE AND PHYSIOLOGICAL THERAPEUTICS              6
## 20 MUSCLES LIGAMENTS AND TENDONS JOURNAL                               6
```

Most cited articles in collection

```
##                                                Paper
DOI  TC TCperYear
## 1  ALFREDSON H, 1998, AM J SPORTS MED                      10.1177/036
35465980260030301      726     30.25
## 2  DE VOS RJ, 2010, J AM MED ASSOC                         10.1001/jam
a.2009.1986            582     48.50
## 3  SMIDT N, 2002, LANCET                                   10.1016/S01
40-6736(02)07811-X     493     24.65
## 4  MAFI N, 2001, KNEE SURG SPORTS TRAUMATOL ARTHROSCOPY     10.1007/s00
1670000148             309     14.71
## 5  HBERG L, 2004, BR J SPORTS MED                          10.1136/bjs
m.2001.000284          301     16.72
## 6  BISSET L, 2006, BR MED J                                10.1136/bmj
.38961.584653.AE       297     18.56
## 7  BANG MD, 2000, J ORTHOP SPORTS PHYS THER                10.2519/jos
pt.2000.30.3.126       289     13.14
## 8  FAHLSTRM M, 2003, KNEE SURG SPORTS TRAUMATOL ARTHROSCOPY 10.1007/s00
167-003-0418-z         249     13.11
## 9  ROMPE JD, 2007, AM J SPORTS MED                         10.1177/036
3546506295940          240     16.00
## 10 DE JONGE S, 2011, AM J SPORTS MED                       10.1177/036
3546511404877          236     21.45
## 11 KUHN JE, 2009, J SHOULDER ELBOW SURG                    10.1016/j.j
se.2008.06.004         228     17.54
## 12 BISSET L, 2005, BR J SPORTS MED                         10.1136/bjs
m.2004.016170          226     13.29
## 13 THANASAS C, 2011, AM J SPORTS MED                       10.1177/036
3546511417113          225     20.45
## 14 MICHENER LA, 2004, J HAND THER                          10.1197/j.j
ht.2004.02.004         224     12.44
## 15 KONGSGAARD M, 2009, SCAND J MED SCI SPORTS              10.1111/j.1
600-0838.2009.00949.x  210     16.15
## 16 SILBERNAGEL KG, 2001, SCAND J MED SCI SPORTS            10.1034/j.1
600-0838.2001.110402.x 210     10.00
## 17 MCCLURE PW, 2004, PHYS THER                             10.1093/ptj
/84.9.832              191     10.61
## 18 BROX JI, 1999, J SHOULDER ELBOW SURG                    10.1016/S10
58-2746(99)90001-0     190      8.26
## 19 MALLIARAS P, 2013, SPORTS MED                           10.1007/s40
279-013-0019-z         186     20.67
## 20 ROOS EM, 2004, SCAND J MED SCI SPORTS                   10.1111/j.1
600-0838.2004.378.x    183     10.17
```

Top 50 author keywords (with counts of use)

```
##                     TENDINOPATHY                   REHABILITATION
EXERCISE
##                               83                               47
41
##                 PHYSICAL THERAPY                         SHOULDER    SH
OULDER IMPINGEMENT SYNDROME
##                               32                               32
31
##                             PAIN                    SHOULDER PAIN
TENNIS ELBOW
##                               30                               27
26
##                  ACHILLES TENDON                    PHYSIOTHERAPY
ROTATOR CUFF
##                               24                               24
24
## SUBACROMIAL IMPINGEMENT SYNDROME               ECCENTRIC TRAINING
EXERCISE THERAPY
##                               22                               21
19
##             LATERAL EPICONDYLITIS                         ACHILLES
ECCENTRIC EXERCISE
##                               18                               17
17
##                   MANUAL THERAPY                       ULTRASOUND
SYSTEMATIC REVIEW
##                               16                               16
15
##              PLATELET-RICH PLASMA                           TENDON
ECCENTRIC
##                               14                               14
13
##             ACHILLES TENDINOPATHY      RANDOMIZED CONTROLLED TRIAL
TREATMENT
##                               12                               12
12
##             PATELLAR TENDINOPATHY                      IMPINGEMENT
TENDINOSIS
##                               11                               10
10
##            CONSERVATIVE TREATMENT                  PATELLAR TENDON
ULTRASONOGRAPHY
##                                9                                9
9
##                        INJECTION               ECCENTRIC EXERCISES
JUMPER'S KNEE
##                                8                                7
7
##          ROTATOR CUFF TENDINOPATHY                      TENDINITIS
FUNCTION
##                                7                                7
6
```

```
##                    CRYOTHERAPY                    DRY NEEDLING
KNEE
##                              5                               5
5
##                  MOTOR CONTROL                        PATELLAR
PHYSICAL THERAPY MODALITIES
##                              5                               5
5
##                QUALITY OF LIFE            SHOULDER IMPINGEMENT
SUBACROMIAL PAIN SYNDROME
##                              5                               5
5
##                       TRAINING                    BIOMECHANICS
##                              5                               4
```

Most productive countries in collection

```
##            Country Articles    Freq SCP MCP MCP_Ratio
## 1  UNITED KINGDOM       53 0.12990  37  16    0.3019
## 2  USA                  47 0.11520  38   9    0.1915
## 3  TURKEY               44 0.10784  43   1    0.0227
## 4  AUSTRALIA            40 0.09804  28  12    0.3000
## 5  SWEDEN               28 0.06863  27   1    0.0357
## 6  CANADA               27 0.06618  23   4    0.1481
## 7  NETHERLANDS          27 0.06618  22   5    0.1852
## 8  SPAIN                20 0.04902  15   5    0.2500
## 9  NORWAY               19 0.04657  11   8    0.4211
## 10 DENMARK              16 0.03922  11   5    0.3125
## 11 GERMANY              14 0.03431   8   6    0.4286
## 12 ITALY                11 0.02696   8   3    0.2727
## 13 BELGIUM               9 0.02206   7   2    0.2222
## 14 GREECE                8 0.01961   4   4    0.5000
## 15 KOREA                 7 0.01716   6   1    0.1429
## 16 IRELAND               6 0.01471   0   6    1.0000
## 17 NEW ZEALAND           6 0.01471   4   2    0.3333
## 18 FINLAND               5 0.01225   4   1    0.2000
## 19 SAUDI ARABIA          4 0.00980   2   2    0.5000
## 20 CHINA                 3 0.00735   2   1    0.3333
```

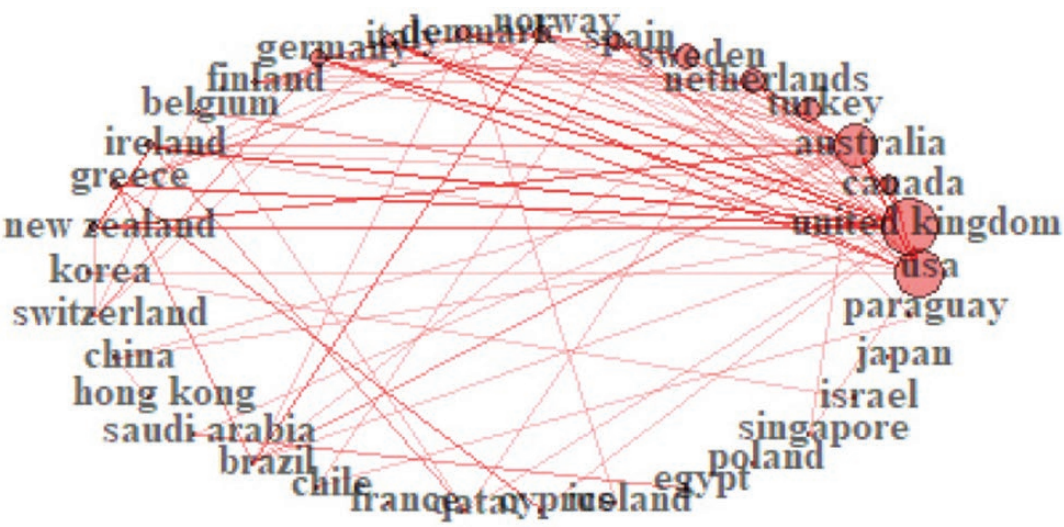

FIGURE 23 Country collaboration network diagram.

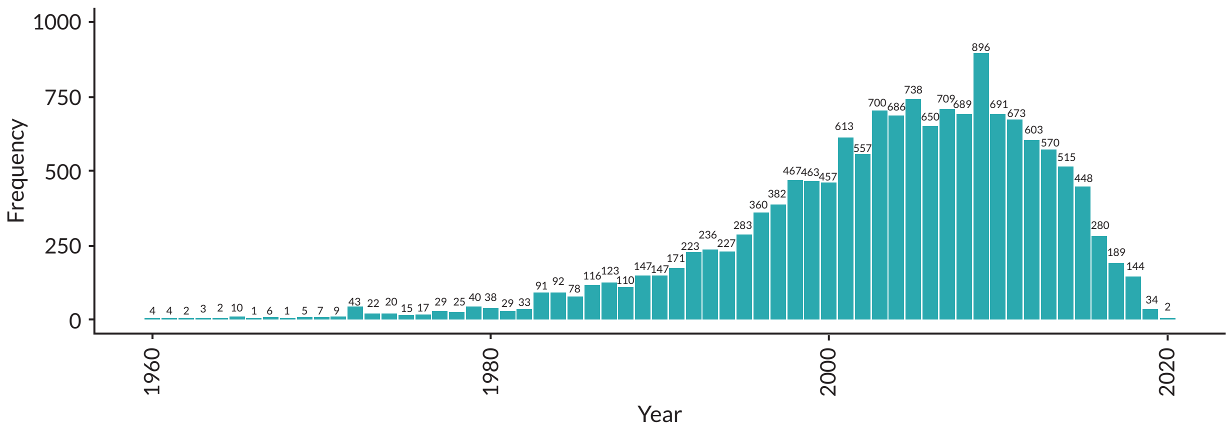

FIGURE 24 Reference distribution over time.

Reference distribution over sources (top 50)

```
##
##                    AM J SPORTS MED                    BR J SPORTS MED
J ORTHOP SPORTS PHYS THER
##                                655                                628
304
##                                BMJ              J SHOULDER ELBOW SURG
SCAND J MED SCI SPORTS
##                                262                                249
248
##                              PHYS THER KNEE SURG SPORTS TRAUMATOL ARTHROSC
J BONE JOINT SURG AM
##                                220                                214
205
##                                                ARCH PHYS MED REHABIL
PAIN
##                                194                                156
145
##                           MAN THER                          SPORTS MED
BRITISH JOURNAL OF SPORTS MEDICINE
##                                143                                134
126
##                    CLIN J SPORT MED                         J HAND THER
FOOT ANKLE INT
##                                126                                123
117
##                       PHYSIOTHERAPY              CLIN ORTHOP RELAT RES
ANN RHEUM DIS
##                                116                                107
104
##            BMC MUSCULOSKELET DISORD          COCHRANE DATABASE SYST REV
J BONE JOINT SURG BR
##                                104                                104
97
##                         CLIN ORTHOP                MED SCI SPORTS EXERC
J ORTHOP RES
##                                 94                                 94
85
##                              LANCET                    CLIN SPORTS MED
J BONE JOINT SURG
##                                 85                                 82
75
##                         ARTHROSCOPY                    BR J SPORTS MED.
JAMA
##                                 70                                 70
70
##                        CLIN REHABIL                    AM J SPORTS MED.
SPINE
##                                 68                                 67
67
##                        RHEUMATOLOGY                   J CLIN EPIDEMIOL
PHYSICAL THERAPY
##                                 64                                 63
```

```
62
##                      DISABIL REHABIL                    ARTHRITIS RHEUM
ORTHOP CLIN NORTH AM
##                                 59                                 57
57
## AMERICAN JOURNAL OF SPORTS MEDICINE                 SCAND J RHEUMATOL
J SCI MED SPORT
##                                 56                                 56
54
##                       MANUAL THERAPY                        INT ORTHOP
J MANIPULATIVE PHYSIOL THER
##                                 54                                 52
51
##                         J RHEUMATOL               INT J SPORTS PHYS THER
##                                 51                                 50
```

Appendix 4 Effectiveness review table of definitions

TABLE 34 Definitions used for exercise therapy classes and treatments

Therapy class	Definition	Therapy treatment	Definition
Resistance	Exercise designed primarily to increase strength of muscles by causing them to produce substantive force against an applied resistance, which can take several forms, including the mass of the body or its segments, isoinertial resistance, elastic resistance, or strength training equipment such as isokinetic devices. In tendinopathy, the stimulus may also be intended to provoke tendon remodelling, reduce pain and improve function.	Concentric only	Includes movements where force produced overcomes the resistance such that muscle shortening occurs.
		Eccentric only	Includes movements where force produced is less than the resistance such that controlled muscle lengthening occurs.
		Concentric and eccentric	Includes movements where force produced exceeds the resistance in one phase and is less than the resistance in another such that controlled muscle lengthening and shortening occurs.
		Isokinetic	Uses specialised exercise equipment such that the resistance is adjusted in real time to ensure joint angular velocity remains constant.
		Isometric	Includes muscular actions against a resistance such that joint angle remains constant.
Flexibility	Exercise designed to increase joint ROM and extensibility of muscles and/or associated tissues. Also referred to as range-of-motion exercises or stretching.	Static	Joint range-of-motion actions where the movement is held at or near the end ROM.
		Dynamic	Joint range-of-motion actions where the movement is performed continuously into and out of the end ROM.
		PNF	Proprioceptive neuromuscular facilitation is a technique combining passive stretching and isometric action to achieve maximum ROM.
		Ballistic	Uses the momentum of a moving body or a limb to increase joint ROM, bouncing into (or out of) a stretched position.
Proprioception	Exercise designed to enhance the sensation of the joint relative to body position and movement, sense of force, and to encourage muscular stabilisation of the joint in the absence of external stabilising devices, e.g. ankle brace.	Sense of joint position and force	Exercise aimed at enhancing the ability to perceive joint position and force with minimal external cues.
		Balance	Includes exercise that requires the person to keep or return the displacement of centre of gravity over the base of support through various environmental conditions and changes in body position.

continued

TABLE 34 Definitions used for exercise therapy classes and treatments (*continued*)

Therapy class	Definition	Therapy treatment	Definition
		Movement pattern retraining	Exercise aimed at re-education of motor control and movement patterns that may involve specific retraining of under- or over-active muscles and alteration of kinematic rotation + translation timing between body segments. May also be termed motor control or stabilisation.
Plyometric	Exercise where a resistance is overcome by a muscle rapidly stretching then shortening.	Plyometric	Exercise where a resistance is overcome by a muscle rapidly stretching then shortening.
Vibration	Exercise where body segments are held stationary or actively displaced as per definitions for other treatment classes whilst applying a rapid oscillating resistance	Vibration	Exercise where body segments are held stationary or actively displaced as per definitions for other treatment classes whilst applying a rapid oscillating resistance

TABLE 35 Definitions used for broad and specific non-exercise classes

Broad therapy class	Definition	Specific therapy class	Definition
Non-active (placebo, sham, wait and see)	Includes any appropriate inactive treatment such as waiting list control, sham shockwave, sham laser, sham taping or true placebo.	Non-active (placebo, sham, wait and see)	Includes any appropriate inactive treatment such as waiting list control, sham shockwave, sham laser, sham taping or true placebo.
Electro-therapy	Modality that delivers therapeutic levels of physical energy to a biological system, e.g. soft tissue.	Shockwave	ESWT (radial or focussed).
		Laser	Low level laser therapy.
		Other	Other less common electro-therapies such as ultrasound, radar and diadynamic current.
Kinetics	Treatment using external devices that alters the kinematics/kinetics of the limb.	Immobilisation	Any intervention that prevents specific features of joint movement, e.g. splinting.
		Altered loading	Any intervention aimed at altering tendon loading, e.g. taping, tennis elbow clasp/brace and orthotics.
MT	MT is the skilled application of 'hands-on' techniques to treat soft tissues and joint structures for the purpose of improving pain, increasing ROM, stimulating tissue repair response, and/or improving function.	MT	MT is the skilled application of 'hands-on' techniques to treat soft tissues and joint structures for the purpose of improving pain, increasing ROM, stimulating tissue repair response, and/or improving function.

TABLE 35 Definitions used for broad and specific non-exercise classes (*continued*)

Broad therapy class	Definition	Specific therapy class	Definition
Injection therapy	Injection therapy for tendinopathy typically involves direct administration of a pharmacologically active drug or combination of drugs using a syringe and needle or equivalent. It may or may not be image-guided.	Autologous	An autologous injection is an injection of a substance drawn from the patient to whom it is then given, usually at the tendinopathy site after content manipulation with the purpose of stimulating tissue healing.
		Drug	An injection of a classified drug, often mixed with another drug (e.g. corticosteroid with local anaesthetic), for the purpose of reducing pain and stimulating tissue healing.
		Volumetric	An injection deliberately constructed to administer a large volume of fluid to exert a mechanical, as well as pharmacological, effect on the tissues to reduce pain, promote tissue healing and mobilise adherent tissue.
Surgery	Any relevant surgical intervention for tendinopathy	Minimally invasive peritendinous	Minimally invasive procedure with small portals and insertion of surgical tools in the peritendinous area.
		Open intra-tendinous	A more traditional open approach where the tendon is exposed and the peri-tendinous and intra-tendinous areas are surgically treated.

TABLE 36 Outcome domains and example outcomes included in review

Domain	ICON definition	Example tools
Disability	Composite scores of a mix of patient-rated pain and disability due to the pain, usually relating to tendon-specific activities/tasks.	VISA scales; DASH; quick DASH; SPADI; patient-rated tennis-elbow evaluation questionnaire; Constant Murley Score; WORC (Western Ontario Rotator Cuff Index); AOFAS (American Orthopaedic Foot & Ankle Society); Roles and Maudsley score; ASES (American Shoulder & Elbow Surgeons Index); Tegner activity score; Lysholm knee scale; Pain-free function questionnaire; Ankle activity score; Subjective elbow value (SEV); Placzek score; Shoulder disability questionnaire; International Knee Documentation Committee form (IKDC); Penn Shoulder score (University of Pennsylvania shoulder score) (PSS); Brief pain inventory (BPI); UCLA Shoulder Rating Scale; FILLA – functional index of leg and lower limb; Neer Shoulder Score; Nirschl phase rating scale; American Shoulder and Elbow Surgeon's (MASES) questionnaire; Mayo Elbow Performance Score (MEPS); Shoulder rating questionnaire (SRQ)

continued

TABLE 36 Outcome domains and example outcomes included in review (*continued*)

Domain	ICON definition	Example tools
Pain on loading/activity	Patient-reported intensity of pain performing a task that loads the tendon	VAS; NRS; Pain experience scale
Pain over a specified time	Patient-reported pain intensity over period of time, e.g. morning/night/24 hours/1 week	VAS; NRS Painful days in 3 months
Pain without further specification	Patient asked about pain levels without reference to activity or timeframe	VAS; NRS; Borg CR10 Scale; Pain status
PFC	Quantitative measures of physical tasks (e.g. hops, times walk, single leg squat); includes muscle strength	Counter movement jump; one-leg triple hop; single-leg decline squat; muscle strength measured by dynamometry (hand-held, isokinetic); repetition maximum; manual muscle testing.
Participation	Patient rating of the level of participation/engagement across areas of their life	Sport participation; return to sport; work ability; return to work; sick leave
Patient rating overall condition	Single-assessment numerical evaluation of symptom status	Global impression/rating of change; patient-acceptable symptom status/state
QoL	General well-being	EQ5D; EQ3D; SF-36 or SF-12; Assessment of QoL (AQoL); Nottingham Health Profile; Gothenburg QoL Instrument
Adverse effects/events	Unwanted unintended effects of treatments	Adverse event reporting
ROM (shoulder only)	Active or passive ROM in specified plane, measured in degrees.	Hand-held goniometer; inclinometer

Appendix 5 Table of included studies in effectiveness review

TABLE 37 Effectiveness review table of included studies

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Achilles						
Balius 2016 Spain[238]	RCT	*N* = 37 % female 20.4 Age 41.4 (11.7) Symptoms NR Training status Other	6	6× 'Exercise only'	Findings confirmed the therapeutic potential of eccentric exercise at reactive and degenerative stages of tendinopathy. MCVC supplementation decreased pain more than eccentric exercise alone (reactive tendinopathy) Personalised stretching regime supplemented with MCVC may be appropriate for some patients.	1a, 1c, 2, 3
Tumilty 2016 New Zealand[632]	RCT	*N* = 80 % female 58.8 Age 47.4 (9.7) Symptoms NR Training status Other	4	2× 'Exercise, Non-Active'; 2× 'Exercise, Electro-Therapy'	Two exercise sessions per week equivalent to twice-daily sessions, with added benefit using laser as an adjunct to exercise.	3
Stefansson 2019 Iceland[184]	RCT	*N* = 58 % female 20.0 Age NR Symptoms NR Training status Other	3	1× 'Exercise only'; 1× 'Non-Exercise only'; 1× 'Exercise, Manual-Therapy'	Similar results for pressure massage and eccentric exercise. Combining pressure massage and eccentric exercise did not improve outcomes.	1a, 1c, 3
Horstmann 2013 Germany[16]	RCT	*N* = 58 % female 44.8 Age 45.3 (7.7) Symptoms NR Training status Recreational	3	2× 'Exercise only'; 1× 'Non-Active'	Vibration training may be an alternative or a complementary treatment in patients who do not respond well to eccentric training, especially in those with insertional pain.	3
Rompe 2007 Germany[558]	RCT	*N* = 75 % female 61.3 Age 48.5 (10.6) Symptoms 10.8 (8.5) Training status Other	3	1× 'Exercise only'; 1× 'Non-Exercise only'; 1× 'Non-Active'	At 4-month follow-up, eccentric loading and low-energy shockwave therapy showed comparable results. The wait-and-see strategy was ineffective for the management of chronic recalcitrant AT.	1a, 1b, 1c, 3
Yelland 2011 Australia[673]	RCT	*N* = 43 % female NR Age 46.7 (NR) Symptoms 17 (NR) Training status Other	3	1× 'Exercise only'; 1× 'Non-Exercise only'; 1× 'Exercise, Injection'	Prolotherapy and particularly eccentric loading exercises combined with prolotherapy gave more rapid improvements in Achilles tendinosis symptoms than eccentric loading exercises alone. Long term VISA-A scores were similar.	1a, 1b, 1c, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Mayer 2007 Germany[474]	RCT	*N* = 28 % female 0.0 Age 38.2 (6.2) Symptoms 13.5 (15.4) Training status Recreational	3	1× 'Exercise, Electro-Therapy, Manual-Therapy'; 1× 'Non-Exercise only'; 1× 'Non-Active'	A 4-week treatment of deep friction and ultrasound in combination with sensory motor and eccentric training, as well as insoles with longitudinal arch support, might reduce pain (at rest and in activity) in most patients with AT.	3
Roos 2004 Sweden[193]	RCT	*N* = 44 % female 52.3 Age 45 (26–60)** Symptoms 5.5 (1–180)* Training status Recreational		1× 'Exercise only'; 1× 'Exercise, Kinetics'; 1× 'Non-Exercise only'	Eccentric exercises reduce pain and improve function in patients with AT.	1a, 1b, 1c, 3
Petersen 2007 Germany[530]	RCT	*N* = 86 % female 40.0 Age 42.5 (11.1) Symptoms 7.4 (2.3) Training status Recreational	3	1× 'Exercise only'; 1× 'Non-Exercise only'; 1× 'Exercise, Kinetics'	The AirHeel brace is as effective as eccentric training in the treatment of chronic AT. There is no added benefit to combining both treatments.	1a, 1c, 3
Boesen 2017 Denmark[162]	RCT	*N* = 44 % female 52.3 Age 45 (26–60)** Symptoms 5.5 (1–180)** Training status Recreational	3	2× 'Exercise, Injection'; 1× 'Exercise, Non-Active'	Treatment with HVI or PRP in combination with eccentric training in chronic AT seems more effective in reducing pain, improving activity level, and reducing tendon thickness and intratendinous vascularity than eccentric training alone. HVI may be more effective in improving outcomes of chronic AT than PRP in the short term.	3
Praet 2019 Australia[130]	RCT	*N* = 20 % female 35.0 Age 43.7 (7.9) Symptoms 54 (90) Training status Recreational	2	1× 'Exercise only'; 1× 'Exercise, Non-Active'	Oral supplementation of specific collagen peptides may accelerate the clinical benefits of a well-structured calf-strengthening and return-to-running programme in patients with chronic AT.	1a, 1c, 3
Kedia 2014 United States[424]	RCT	*N* = 36 % female 72.2 Age 53.6 (9.2) Symptoms NR Training status Other	2	2× 'Exercise, Kinetics'	Conventional physical therapy consisting of gastrocnemius, soleus and hamstring stretches, ice massage on the Achilles tendon, and use of heel lifts and night splints with or without eccentric training is effective for treating insertional AT.	3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Bell 2013 New Zealand[251]	RCT	*N* = 53 % female 47.0 Age 49 (10.1) Symptoms 30.9 (60.3) Training status Recreational	2	1× 'Exercise, Injection'; 1× 'Exercise, Non-Active'	The addition of two peritendinous autologous blood injections administered 1 month apart, to a standardised eccentric training programme provides no added benefit in the treatment of mid-portion AT.	3
Boesen 2019 Denmark[163]	RCT	*N* = 28 % female 0.0 Age 43.0 (6.0) Symptoms 10.1 (4.8) Training status Other	2	2× 'Exercise, Injection'	HVI with or without corticosteroid in combination with eccentric training seems effective in AT. HVI with corticosteroid showed a better short-term improvement than HVI without corticosteroid, indicating a short-term effect of corticosteroid in the treatment of AT.	3
Beyer 2015 Denmark[18]	RCT	*N* = 58 % female 31.9 Age 48.0 (2.0) Symptoms 18.1 (4.3) Training status Other	2	2× 'Exercise only'	Both traditional eccentric exercise and HSR yield positive, equally good and lasting clinical results in patients with AT. HSR is associated with greater patient satisfaction after 12 weeks but not after 52 weeks.	1a, 1b, 1c, 2, 3
Stergioulas 2008 Norway[604]	RCT	*N* = 52 % female 37.5 Age 29.5 (4.8) Symptoms 9.9 (3) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	Low-level laser therapy, with the parameters used in this study, accelerates clinical recovery from chronic AT when added to an eccentric exercise regimen. For the LLLT group, the results at 4 weeks were similar to the placebo LLLT group results after 12 weeks.	3
de Vos 2010 Netherlands[314]	RCT	*N* = 54 % female 52.0 Age 49.5 (8.7) Symptoms 7.1 (4.6–20.9)* Training status Other	2	1× 'Exercise, Injection'; 1× 'Exercise, Non-Active'	Among patients with chronic AT who were treated with eccentric exercises, a PRP injection compared with a saline injection did not result in greater improvement in pain and activity.	3
de Vos 2007 Netherlands[59]	RCT	*N* = 63 % female 41.3 Age 44.6 (8) Symptoms 30.6 (50.6) Training status Recreational	2	1× 'Exercise only'; 1× 'Exercise, Kinetics'	A night splint has no added benefit to eccentric exercises in the treatment of chronic midportion AT. There was no significant difference between the two groups in VISA-A score and patient satisfaction.	1a, 1b, 1c, 3
Stevens 2014 United Kingdom[175]	RCT	*N* = 28 % female 60.7 Age 48.7 (10.8) Symptoms 7.4 (4.0) Training status Other	2	2× 'Exercise only'	Performing a 6-week do-as-tolerated programme of eccentric heel-drop exercises compared to the recommended 180 repetitions per day, did not lead to lesser improvement for individuals with midportion AT, based on VISA-A and VAS scores.	1a, 1b, 1c, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Mafi 2001 Sweden[467]	RCT	*N* = 44 % female 45.5 Age 48.3 (8.8) Symptoms 20.5 (3–120)** Training status Other	2	2× 'Exercise only'	Eccentric calf-muscle training showed superior results to concentric training in the treatment of chronic Achilles tendinosis based on patient satisfaction and return to activity level.	1a, 1c, 2, 3
Nørregaard 2007 Denmark[499]	RCT	*N* = 35 % female 49.0 Age 42.0 (2.0)*** Symptoms 28.4 (8.8)*** Training status Other	2	2× 'Exercise only'	Symptoms gradually improved during the 1-year follow-up period and were significantly better assessed by pain and symptoms after 3 weeks and all later visits. However, no significant differences could be observed between the two groups.	1a, 1b, 1c, 2, 3
Silbernagel 2007 Sweden[138]	RCT	*N* = 38 % female 47.4 Age 46.0 (8.0) Symptoms 36.2 (66.5) Training status Other	2	2× 'Exercise only'	Our treatment protocol, which gradually increases the load on the Achilles tendon and calf muscle, demonstrated significant improvements. Continuing tendon loading activity such as running and jumping with the use of a pain-monitoring model did not have any adverse effect.	1a, 1c, 3
Alfredson 1998 Sweden[17]	Quasi-experimental	*N* = 30 % female 20.0 Age 44.0 (7.0) Symptoms 25.9 (3–100)** Training status Recreational	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Our treatment model with heavy-load eccentric calf-muscle training has a very good short-term effect on athletes in their early forties.	1a, 1c, 3
Rompe 2009 Germany[559]	RCT	*N* = 68 % female 55.9 Age 49.7 (9.9) Symptoms 14.5 (6.0) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Electro-Therapy'	The likelihood of recovery after 4 months was higher after a combined approach of both eccentric loading and shockwave therapy compared to eccentric loading alone.	1a, 1c, 3
Silbernagel 2001 Sweden[587]	RCT	*N* = 47 % female 22.5 Age 44.0 (12.5) Symptoms 30.5 (40.7) Training status Recreational	2	2× 'Exercise only'	The eccentric overload protocol used in the present study can be recommended for patients with chronic pain from the Achilles tendon. More patients achieved full recovery, improved pain and ROM in the Exp group compared to the control group.	1a, 1b, 1c, 2, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Knobloch 2008 Italy[437]	RCT	*N* = 92 % female 35.0 Age 47.5 (11.0) Symptoms NR Training status Recreational	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Patients with tendinopathy of the main body of the AT experienced improved clinical outcome with both management options. Although tendon microcirculation was optimised in the combined group of eccentric training and AirHeel Brace, these micro-vascular advantages do not translate into superior clinical performance when compared with eccentric training alone.	1b, 3
Tumilty 2012 New Zealand[630]	RCT	*N* = 33 % female 55.0 Age 46.1 (7.8) Symptoms NR Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	No evidence for clinical effectiveness of adding LLLT to eccentric exercises for the treatment of AT.	3
Notarnicola 2014 Italy[500]	Quasi-experimental	*N* = 60 % female 56.8 Age 58.5 (13.3) Symptoms NR Training status Other	2	2× 'Exercise, Electro-Therapy'	Cryo high-energy laser therapy (CHELT) gave quicker and more effective pain relief compared to ESWT at 2-month and 6-month follow-up.	3
Wiedmann 2017 Germany[664]	RCT	*N* = 20 % female 65.0 Age 43.0 (6.0) Symptoms NR Training status Other	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Eccentric training improved the VISA-A and VAS scores after 12 weeks more than physiotherapy treatment.	1a, 1c, 3
Yu 2013 Korea (Republic of)[680]	Quasi-experimental	*N* = 32 % female 0.0 Age 30.3 (1.6) Symptoms 11.7 (2.1) Training status Other	2	2× 'Exercise only'	Eccentric strengthening was more effective than concentric strengthening in reducing pain and improving function in patients with AT.	1a, 1c, 2, 3
Alfredson 1999 Sweden[224]	Quasi-experimental	*N* = 24 % female 14.3 Age 42.6 (9.0) Symptoms 23.7 (3–100)** Training status Recreational	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Heavy-loaded, eccentric calf-muscle training seems to be a good treatment mode for chronic Achilles tendinosis.	1a, 1c, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Pearson 2012 New Zealand[525]	RCT	*N* = 40 % female 62.5 Age 50.0 (8.2) Symptoms 11.0 (10.0) Training status Other	2	1× 'Exercise, Injection'; 1× 'Exercise only'	There is some evidence for small short-term symptomatic improvements with the addition of autologous blood injection to standard treatment for AT.	1a, 1c, 3
McCormack 2016 United States[478]	RCT	*N* = 15 % female 68.8 Age 53.6 (38–69)** Symptoms 9.9 (NR) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Manual-Therapy'	Soft tissue treatment (Astym) plus eccentric exercise was more effective than eccentric exercise alone at improving function during both short- (26 weeks) and long-term (52 weeks) follow-up periods.	1b, 3
Gatz 2020 Germany[365]	RCT	*N* = 42 % female 35.7 Age 50.0 (12.0) Symptoms 27.5 (23.8) Training status Other	2	2× 'Exercise only'	No additional clinical benefits of adding ISOs to a basic EE programme could be found in this preliminary RCT study over a period of 3 months. SWE was able to differentiate between insertional and midportion tendon tissue and localise reported symptoms to sublocations but this did not correlate with better clinical scores (VISA-A) over a 3-month follow-up period.	1a, 1b, 1c, 2, 3
Jonsson 2009 Sweden[408]	Quasi-experimental	*N* = 15 % female 13.3 Age 25.0 (NR) Symptoms 17.5 (13.2) Training status Other	2	2× 'Exercise only'	Treatment with painful eccentric calf-muscle training showed good clinical results based on VAS scores, patient satisfaction, and return to pre-injury activity levels in patients with chronic painful mid-portion Achilles tendinosis, but not in patients with chronic insertional Achilles tendon pain.	1a, 1b, 1c, 2, 3
van Der Vlist 2020 Netherlands[646]	RCT	*N* = 79 % female 51.0 Age 47.9 (9.0) Symptoms 14.3 (NR) Training status Other	2	1× 'Exercise, Injection'; 1× 'Exercise only'	High-volume injection without corticosteroids in addition to usual care is not effective for symptom reduction in patients with chronic midportion AT.	3
Knobloch 2007 Germany[684]	RCT	*N* = 20 % female 45.0 Age 32.5 (11.0) Symptoms NR Training status	2	1× 'Exercise only'; 1× 'Non-Active'	An eccentric-training programme performed daily over 12 weeks reduced the increased paratendinous capillary blood flow in AT by as much as 45% and decreased pain level based on a VAS. Local paratendon oxygenation was preserved while paratendinous postcapillary venous filling pressures were reduced after 12 weeks of eccentric training, which appears to be beneficial from the perspective of microcirculation.	1a, 1c, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Romero-Morales 2020 Spain[685]	RCT	*N* = 61 % female 26 Age 41.6 (8.7) Symptoms 4.25 (3.5) Training status Other	2	2× 'Exercise only'	Authors encourage the use of vibration with respect to cryotherapy added to eccentric exercise programmes in order to enhance multifidus cross-sectional area in addition to lower-limb functionality in individuals who suffer from chronic non-insertional AT.	1a, 1c, 2, 3
Knobloch 2007 Germany[192]	RCT	*N* = 118 % female 40 Age 48.5 (12) Symptoms NR Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Achilles tendon oxygen saturation is increased and capillary venous clearance facilitated using an Achilles wrap in addition to daily 12-week eccentric training.	1a, 1b, 1c, 3
Rabusin 2020 Australia[686]	RCT	*N* = 100 % female 52.0 Age 45.85 (9.4) Symptoms 20.25 (NR) Training status Other	2	1× 'Non-Exercise only'; 1× 'Exercise only'	In adults with mid-portion AT, heel lifts were more effective than calf muscle eccentric exercise in reducing pain and improving function at 12 weeks.	1a, 1b, 1c, 3
Rompe 2008 Germany[687]	RCT	*N* = 50 % female 60.0 Age 39.8 (11) Symptoms 25.55 (9.45) Training status Other	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Eccentric loading as applied in the present study showed inferior results to low-energy shockwave therapy as applied in patients with chronic recalcitrant tendinopathy of the insertion of the Achilles tendon at 4-month follow-up.	1a, 1b, 1c, 3
de Jonge 2008 Netherlands[309]	RCT	*N* = 70 % female NR Age 44.6 (26–59) ** Symptoms 30.7 (2–204) ** Training status Other	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Eccentric exercises with or without a night splint improved functional outcome at 1-year follow-up. At follow-up there was no significant difference in clinical outcome when a night splint was used in addition to an eccentric exercise.	1a, 1b, 1c, 3
Biceps						
Genc 2020 Turkey[688]	RCT	*N* = 80 % female 62.5 Age 45.8 (8.5) Symptoms 5.2 (4.6) Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Kinesiotaping application decreases pain and increases the functional capacity level and can also play a role in improving the general QoL in biceps tendinitis treatment.	3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Gluteal (including GTPS)						
Rompe 2009 Germany[557]	RCT	*N* = 68 % female 55.9 Age 49.7 (9.9) Symptoms 14.5 (6) Training status Other	3	1× 'Exercise only'; 2× 'Non-Exercise only'	Both corticosteroid injection and home training were significantly less successful than was shockwave therapy at 4-month follow-up. Corticosteroid injection was significantly less successful than was home training or shockwave therapy at 15-month follow-up.	1b, 3
Ganderton 2018 Australia[189]	RCT	*N* = 90 % female 100 Age 61.83 (7.81) Symptoms NR Training status Other	2	2× 'Exercise only'	Lack of treatment effect was found with the addition of an exercise programme to a comprehensive education on GTPS management. The improved outcomes of the responders in the GLoBE group indicate that there may be a subgroup of patients with a GTPS diagnosis that benefit from a GLoBE intervention programme.	1b, 3
Ramon 2020[689]	RCT	*N* = 102 % female 71.5 Age 56.35 (11.95) Symptoms NR Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	F-ESWT in association with a specific exercise programme is safe and effective for GTPS, with a success rate of 86.8% at 2 months after treatment, which was maintained until the end of follow-up.	3
Slider 2013 United States[690]	RCT	*N* = 24 % female 79.2 Age 24.0 (9.0) Symptoms NR Training status Recreational	2	2× 'Exercise only'	In general, subjects with an acute hamstring strain injury treated with either the PATS or PRES rehabilitation programme demonstrated a similar degree of muscle recovery at the time of return to sport. Despite this, there were no subjects who exhibited complete resolution of injury on MRI, and 2 of the 4 subjects who reinjured themselves did so within the first 2 weeks after return to sport.	2, 3
Hamstring						
Cacchio 2011 Italy[271]	RCT	*N* = 40 % female 32.5 Age 23.95 (2.09) Symptoms 20.3 (6.3) Training status Performance	2	1× 'Non-Exercise only'; 1× 'Exercise, Manual-Therapy'	SWT is a more effective treatment to conservative treatment for proximal hamstring tendinopathy.	3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Askling 2014 Sweden[232]	RCT	*N* = 56 % female 32 Age 20 (3.6) Symptoms NR Training status Performance	2	2× 'Exercise only'	A rehabilitation protocol emphasising lengthening type of exercises is more effective than a protocol containing conventional exercises in promoting time to return in Swedish elite sprinters and jumpers.	3
Lateral elbow/tennis elbow						
Coombes 2013 Australia[176]	RCT	*N* = 165 % female 38 Age 49.7 (8.1) Symptoms 16.0 (10–26)* Training status Other	4	1× 'Non-Exercise only'; 1× 'Exercise, Injection, Manual-Therapy'; 1× 'Non-Active';1×× 'Exercise, Manual-Therapy, Non-Active'	Multimodal physiotherapy provided no beneficial long-term effect on complete recovery, recurrence, pain, disability or QoL. However, in the absence of a corticosteroid injection, physiotherapy may provide a short-term benefit across all outcomes. Corticosteroid injections generally results in a poorer clinical outcome.	3
Tonks 2007 United Kingdom[624]	RCT	*N* = 34 % female NR Age 44.3 (7.1) Symptoms NR Training status Other	4	2× 'Non-Exercise only'; × 'Exercise only'	Patients who received steroid injection were statistically significantly better for all outcome measures at follow up. No statistically significant effect of physiotherapy nor interaction between physiotherapy and injection was found.	1a, 1b, 1c, 3
Tonks 2012 United Kingdom[623]	RCT	*N* = % female 54.6 Age 45.46 (8.2) Symptoms 3.8 (0.5–24)** Training status Other	3	1× 'Non-Active'; 1× 'Non-Exercise only'; 1× 'Exercise, Electro-Therapy, Manual-Therapy'	In the short term, the injection group showed superior effectiveness, whereas exercise is more effective for long-term management of tennis elbow.	3
Smidt 2002 Netherlands[592]	RCT	*N* = 185 % female 50.27 Age 47 (41–54)* Symptoms 11 (8–16)* Training status Other	3	1× 'Non-Exercise only'; 1× 'Exercise only'; 1× 'Exercise, Injection, Kinetics'	Injection showed better outcomes at 6 weeks. In the long term, physiotherapy had better results than the wait-and-see policy although differences were not significant.	3
Luginbuhl 2008 Switzerland[174]	RCT	*N* = 30 % female 72.7 Age 47 (9) Symptoms 10 (11) Training status Other	3	1× 'Exercise, Kinetics'; 1× 'Exercise, Non- Active'; 1× 'Exercise only'	No beneficial effect of either the forearm support band or the strengthening exercises could be found.	1a, 1c, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Wegener 2016 Australia[655]	RCT	*N* = 40 % female 70 Age 49.52 (8.09) Symptoms NR Training status NR	3	2× 'Non-Exercise only'; 1× 'Exercise only'	Whilst all groups improved on key outcomes, it is possible that exercise alone and/or natural recovery were responsible for improvements.	1a, 1c, 3
Stasinopoulos 2006 Greece[599]	Quasi-experimental	*N* = 75 % female 38.6% Age 40.3 (5.8) Symptoms 5 (NR) Training status Other	3	3× 'Exercise, Electro-Therapy'	Cyriax physiotherapy, a supervised exercise programme and polarised polychromatic non-coherent light reduced pain and improved function at the end of the treatment and at any of the follow-up time points. The supervised exercise programme produced the largest effect in the short, intermediate and long term.	1a, 1c, 3
Lee 2014 Korea (Republic of)[456]	RCT	*N* = 40 % female 57.5 Age 44.26 (9.5) Symptoms NR Training status Other	3	1× 'Exercise, Injection, Manual-Therapy'; 1× 'Exercise, Manual-Therapy, Non-Active'; 1× 'Non-Active'	3 days per week for 3 weeks of physical therapy improves pain and function in patients with acute lateral epicondylitis. After 3 weeks, 6 days per week is the most effective treatment frequency.	3
Olaussen 2015 Norway[506]	RCT	*N* = 177 % female 40 Age 46.9 (9.7) Symptoms 1.8 (0.9–2.3)* Training status Other	3	3× 'Exercise only', 'Exercise only', 'Exercise only'	Placebo injection with physiotherapy consisting of deep transverse friction massage, Mills manipulation, stretching and eccentric exercises showed no clear beneficial effect on acute lateral epicondylitis. CI with physiotherapy had a large positive effect on success of treatment at 6 weeks, no difference at 12 weeks, worsening at 26 weeks but no significant negative effect at 52 weeks compared to control. No significant differences in primary and secondary measures between CI and placebo injection suggest no added effect to steroid injection.	3
Stasinopoulos 2017 Cyprus[597]	RCT	*N* = 34 % female 55.8 Age 43.7 (4.6) Symptoms 6 (NR) Training status Recreational	3	1× 'Exercise only'; 2× 'Exercise, Injection'	Eccentric training, eccentric-concentric training and eccentric-concentric training combined with isometric contraction reduced pain and improved function at the end of the treatment and follow-up. The eccentric-concentric training combined with isometric contraction produced the largest effect at the end of the treatment and follow-up.	1a, 1c, 2, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Yerlikaya 2018 Turkey[675]	Quasi-experimental	*N* = 90 % female 71.1 Age 48.6 (8.8) Symptoms NR Training status Other	3	3× 'Exercise only'	Lateral epicondylitis does not seem to be affected by either leukocyte-rich PRP or leukocyte-poor PRP on pain and function in the short term.	1a, 3
Martinez-Silvestrini 2005 United States[471]	Quasi-experimental	*N* = 81 % female 46.8 Age 45.5 (7.7) Symptoms NR Training status Other	3	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Electro-Therapy, Kinetics'; 1× 'Exercise, Electro-Therapy'	Eccentric strengthening for the wrist extensors in subjects with lateral epicondylitis demonstrated improvement at 6x weeks but was not statistically different from that achieved with a conservative programme with stretching or a concentric strengthening programme.	1a, 1c, 2, 3
Eraslan 2018 Turkey[347]	RCT	*N* = 45 % female 24.4 Age 47.9 (6.6) Symptoms NR Training status Other	3	1× 'Exercise, Kinetics'; 1× 'Exercise, Non-Active'; 1× 'Exercise only'	Kinesiotaping effectively decreased pain intensity, recovered grip strength, and improved function in patients with lateral epicondylitis undergoing rehabilitation.	3
Giray 2019 Turkey[368]	RCT	*N* = 30 % female 86.7 Age 44.46 (9.92) Symptoms 1.69 (NR) Training status Other	3	1× 'Exercise, Electro-Therapy, Manual-Therapy'; 1× 'Non-Exercise only'; 1× 'Exercise, Electro-Therapy, Kinetics, Manual-Therapy'	Kinesiotaping in addition to exercises is more effective than sham taping and exercises alone in improving pain in daily activities and arm disability due to lateral epicondylitis.	1a, 1c, 3
Struijs 2004 Netherlands[608]	RCT	*N* = 180 % female 55.7 Age 45.33 (9.33) Symptoms 20 (27.7) Training status Other	3	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	Conflicting results were found. Brace treatment might be useful as initial therapy. Combination therapy has no additional advantage compared to physical therapy but is superior to brace only for the short term (6 weeks).	3
Yuruk 2014 Turkey[683]	RCT	*N* = 30 % female 76.6 Age 47.17 (8.02) Symptoms 22.13 (21.29) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Kinetics'	The addition of shockwave to exercise is more effective than placebo shockwave with exercise.	3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Nowotny 2018 Germany[501]	RCT	*N* = 31 % female 57 Age 46 (NR) Symptoms NR Training status Other	2	1× 'Exercise, Manual-Therapy, Non-Active'; 1× 'Exercise, Manual-Therapy'	The use of an elbow orthosis appears to reduce pain and improve other subjective outcome measures. However, the long-term results do not appear to be any greater than those received through physiotherapy alone.	1a, 1c, 3
Røe 2005 Norway[691]	RCT	*N* = 55 % female 54.55 Age 42.45 (8.89) Symptoms 13.09 (16.6) Training status Other	2	1× 'Exercise, Non-Active'; 1× 'Exercise, Electro-Therapy'	Supplementation with essential fatty acids appears to have no additional benefit in comparison to eccentric training alone.	3
Chung 2004 Canada[290]	RCT	*N* = 60 % female 38.3 Age 46.17 (8.01 Symptoms 4.7 (3.3) Training status Other	2	2× 'Exercise, Electro-Therapy'	ESWT combined with stretching were no more effective than stretching alone in the treatment of lateral epicondylitis.	3
Celik 2019 Turkey[277]	RCT	*N* = 24 % female 74 Age 48.1 (19.3) Symptoms 8.2 (6–10)* Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Both photobiomodulation and ESWT are useful and can be used in the treatment of LE based-on improvements in handgrip strength. Improvements for elbow extension and shoulder flexion strength and VAS were mainly observed in the photobiomodulation group.	3
Nishizuka 2017 Japan[498]	RCT	*N* = 110 % female 39.1 Age 53.6 (11.8) Symptoms 2.04 (1.77) Training status Other	2	2× 'Exercise, Kinetics'	A forearm band may have no more than a placebo effect and is not recommended based on its effectiveness.	1a, 1b, 3
Söderberg 2012 Sweden[594]	RCT	*N* = 37 % female 57.1 Age 49 (11.5) Symptoms NR Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Electro-Therapy, Kinetics, Manual-Therapy'	Daily home eccentric exercise regimen is effective in increasing functional pain-free grip strength and reducing cases suffering from lateral epicondylalgia.	3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Kachanathu 2019 Saudi Arabia[413]	RCT	*N* = 40 % female 45 Age 37.9 (0.27) Symptoms NR Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Exercise only'	Wrist joint splinting in addition to physical therapy for a short duration was effective at improving pain intensity in patients with lateral epicondylitis.	3
Reyhan 2020 Turkey[549]	RCT	*N* = 40 % female 82.5 Age 42.4 (9.9) Symptoms 4 (0.78) Training status Other	2	2× 'Exercise, Electro-Therapy'	MWM plus exercise and cold therapy is safe and effective at improving elbow pain, functional capacity, and grip strength.	1a, 1b, 3
Stasinopoulos 2009 Greece[600]	Quasi-experimental	*N* = 50 % female 54.0 Age 45.9 (6.7) Symptoms NR Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	An exercise programme consisting of eccentric and static stretching exercises, and LLLT or polarised polychromatic non-coherent light are both adequate treatment modalities for patients with LET	3
Stergioulas 2007 Greece[603]	RCT	*N* = % female Age Symptoms Training status	2	2× 'Exercise only'	Combination of laser along with plyometric exercises and stretching is more effective than placebo laser and exercise in the treatment of patients with LE.	3
Stasinopoulos 2010 Greece[601]	Quasi-experimental	*N* = % female Age Symptoms Training status	2	1× 'Exercise only'; 1× 'Exercise, Electro-Therapy'	Supervised exercise programme is superior to HEP to reduce pain and improve function in patients with LET at the end of the treatment and at the follow-up.	1a, 1c, 3
Wen 2011 United States[657]	RCT	*N* = 28 % female 46.4 Age 46 (7.3) Symptoms 3.3 (2.2) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Electro-Therapy, Manual-Therapy'	The authors were unable to show any statistical advantage to eccentric exercises for lateral epicondylosis compared with local modalities and stretching exercises.	1a, 1c, 3
Bagcier 2019 Turkey[235]	Quasi-experimental	*N* = 40 % female NR Age 41.25 (13.53) Symptoms 4.55 (1.89) Training status Oth er	2	2× 'Exercise, Electro-Therapy, Manual-Therapy'	ESWT and DN combination therapy in lateral epicondylitis provide better clinical outcomes than ESWT treatment alone.	3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Croisier 2007 Belgium[304]	Quasi-experimental	*N* = 92 % female 60.9 Age 39 (8) Symptoms 8 (3.5) Training status Other	2	2× 'Exercise, Electro-Therapy, Manual-Therapy'	Isokinetic adapted eccentric training significantly reduced pain intensity, improved tendon structure, strength, disability and participation compared to the non-strengthening control group in the management of chronic lateral epicondylar tendinopathy.	3
Tyler 2010 United States[636]	RCT	*N* = 21 % female 55 Age 48.9 (3.7) Symptoms 1.59 (0.61) Training status Other	2	1× 'Exercise only'; 1× 'Non-Active'	All outcome measures for chronic lateral epicondylosis were markedly improved with the addition of an eccentric wrist extensor exercise to standard physical therapy through the novel use of an inexpensive rubber bar.	3
Peterson 2011 Sweden[531]	RCT	*N* = 81 % female 42 Age 48.25 (8.35) Symptoms 23.3 (35.9) Training status Other	2	2× 'Exercise only'	Exercise appears to be superior to the control group in reducing pain in chronic lateral epicondylosis.	1a, 1c, 3
Dimitrios 2013 Cyprus[692]	Quasi-experimental	*N* = 60 % female 36.7 Age 47.57 (5.9) Symptoms 4.5 (NR) Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise, Injection, Kinetics'	A specific supervised exercise programme is superior to a specific HEP in reducing pain and improving function in patients with LET at the end of the treatment and at the 3-month follow-up.	1a, 1b, 2, 3
Gedik 2016 Turkey[341]	Quasi-experimental	*N* = 45 % female 74.2 Age 52.33 (8.93) Symptoms 24.4 (21.5) Training status Other	2	1× 'Exercise only'; 1× 'Non-Active'	Autologous blood injection is effective in patients with LE and this effectiveness has continued at 6 months. Therefore, autologous blood injection is effective and has relatively few side effects.	3
Vuvan 2019 Australia[187]	RCT	*N* = 39 % female 28 Age 48.5 (9) Symptoms 4 (NR) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Manual-Therapy'	Unsupervised isometric exercise was effective in improving pain and disability, but not perceived rating of change and pain-free grip strength when compared with wait-and-see at 8 weeks. With only one of the three primary outcomes being significantly improved, it is doubtful if isometric exercises can be an efficacious standalone treatment.	1a, 1b, 1c, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Sevier 2015 United States[584]	RCT	*N* = 90 % female 57.9 Age 46.95 (6.55) Symptoms NR Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Non-Active'	Astym therapy is an effective treatment option for patients with LE tendinopathy, as an initial treatment, and after an eccentric exercise programme has failed.	1a, 1b, 1c, 3
Park 2010 Korea (Republic of)[521]	RCT	*N* = % female Age Symptoms Training status	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Isometric strengthening exercises done early in the course of LE (within 4 weeks) provide a clinically significant improvement.	1a, 1c, 3
Svernlov 2001 Sweden[614]	Quasi-experimental	*N* = 57 % female 61.3 Age 50.15 (NR) Symptoms 6.3 (NR) Training status Other	2	2× 'Exercise only'	Significant improvements observed for VAS and grip strength warrant clinical use of this regime.	1a, 1c, 3
Peterson 2014 Sweden[185]	RCT	*N* = 120 % female 47.5 Age 47.9 (8.1) Symptoms NR Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Exercise, Electro-Therapy'	Eccentric graded exercise reduced pain and increased muscle strength in chronic tennis elbow more effectively than concentric graded exercise at follow-up. However, there were no significant differences in function or QoL measures between the two groups.	1a, 1c, 2, 3
Rodríguez-Huguet 2020 Spain[693]	RCT	*N* = 36 % female 25 Age 40.04 (9.88) Symptoms NR Training status Other	2	2× 'Exercise, Kinetics'	This study provides evidence that percutaneous electrolysis could be more effective than trigger-point dry needling for short- and medium-term improvement of pain and pressure pain thresholds in lateral epicondylalgia when added to an eccentric exercise programme.	3
McQueen 2020 United States[694]	RCT	*N* = 59 % female 63 Age NR Symptoms NR Training status Other	2	2× 'Exercise only'	This study demonstrates that a therapy programme consisting of a low number of visits spaced out over 12 weeks based on education, stretches, activity modification and pain management techniques is effective at reducing pain and increasing function in patients with lateral epicondyle tendinopathy. The addition of strengthening to this programme did not improve outcomes.	3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Manias 2006 United Kingdom[469]	RCT	*N* = 40 % female 67.5 Age 42.86 (6.23) Symptoms NR Training status Other	2	2× 'Exercise only'	An exercise programme consisting of eccentric and static stretching exercises had reduced the pain in patients with lateral epicondyle tendinopathy at the end of the treatment and at the follow-up whether or not ice was included.	1a, 1c, 3
Stasinopoulos 2013 Greece[331]	RCT	*N* = 60 % female 36.7 Age 48.0 (5.9) Symptoms 4.5 (NR) Training status Other	2	1× 'Non-Exercise only'; 1× 'Exercise, Injection, Manual-Therapy'; 1× 'Non-Active';1× 'Exercise, Manual-Therapy, Non-Active'	A specific supervised exercise programme is superior to a specific HEP in reducing pain and improving function in patients with lateral epicondyle tendinopathy at the end of the treatment and at the 3-month follow-up.	1a, 1c, 2, 3
Other						
Chen 2017 Taiwan[284]	RCT	*N* = 120 % female NR Age NR Symptoms NR Training status Other	4	4× 'Exercise, Electro-Therapy, Manual-Therapy'	Combined treatment (eccentric, ESWT and conventional) improved patients with noncalcific subscapular tendinosis.	3
Ilhanli 2015[695]	RCT	*N* = 62 % female 72.6 Age 59.4 (10.2) Symptoms 7.2 (3.8) Training status Other	2	1× 'Non-Exercise only'; 1× 'Exercise, Electro-Therapy'	When we compared with physical therapy, PRP seemed to be a well-tolerated application which showed promising results in patients with chronic partial supraspinatus tears.	3
Turgut 2017 Turkey[633]	RCT	*N* = 30 % female 46.7 Age 36.45 (17.5) Symptoms 6.28 (5.4) Training status Other	2	2× 'Exercise only'	Progressive exercise training independent from specific scapular stabilisation exercises provides decreased disability and pain severity in impingement syndrome. All groups showed improvement; however, there were no significant differences between the groups.	1a, 1c, 2, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Patellar						
Scott 2019 Canada[577]	RCT	*N* = 57 % female 15 Age 32 (8.3) Symptoms 24.7 (22.3) Training status Recreational	3	2× 'Exercise, Injection'; 1× 'Exercise, Non-Active'	Combined with an exercise-based rehabilitation programme, a single injection of leukocyte-rich PRP or leukocyte-poor PRP was no more effective than saline for the improvement of patellar tendinopathy symptoms.	3
Cho 2017 Korea (Republic of)[289]	Quasi-experimental	*N* = 30 % female 46.7 Age 33.1 (29.1) Symptoms 15.1 (16.1) Training status Other	3	1× 'Exercise, Injection'; 1× 'Exercise only; 1× 'Non-Exercise only'	A rehabilitation exercise programme was more effective at improving pain, strength and function in patellar tendinopathy than injection therapy alone.	1a, 1c, 3
Kongsgaard 2009 Denmark[21]	RCT	*N* = 37 % female 0 Age 32.4 (8.8) Symptoms 18.7 (12.3) Training status Recreational	3	1× 'Non-Exercise only'; 2× 'Exercise only', 'Exercise only'	Corticosteroid injection has good short-term but poor long-term clinical effects, in patellar tendinopathy. Heavy-slow resistance exercise has good short- and long-term clinical effects accompanied by pathology improvement and increased collagen turnover.	1a, 1b, 1c, 2, 3
van Ark 2016 Australia[644]	RCT	*N* = 19 % female 6.9 Age 23 (4.7) Symptoms 35.8 (33.8) Training status Recreational	2	2× 'Exercise only'	This study found favourable results for athletes with patellar tendinopathy without modification of the training. Both isometric and isotonic exercise programmes reduced pain and improved function in athletes with patellar tendinopathy during a season.	1a, 1b, 1c, 2, 3
Bahr 2006 Norway[131]	RCT	*N* = 40 % female 12.5 Age 30.5 (7.9) Symptoms 34 (28.7) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Surgery'	No added benefit was observed for surgical treatment to eccentric strength training. Eccentric training should be offered for 12 weeks before tenotomy is considered for the treatment of patellar tendinopathy.	1a, 1b, 1c, 3
Warden 2008 United States[652]	RCT	*N* = 37 % female 18 Age 27 (7) Symptoms 44.4 (43.2) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	Low-intensity pulsed ultrasound does not provide any additional benefit over and beyond placebo in the management of patellar tendinopathy.	3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Clarke 2010 United Kingdom[294]	RCT	*N* = 60 % female 10.9 Age 36 (20–51)** Symptoms 11.1 (6–39)** Training status Other	2	2× 'Exercise, Injection'	Ultrasound-guided injection of autologous skin-derived tendon-like cells can be safely used in the short term alongside exercise to treat patellar tendinopathy, with faster response of treatment and significantly greater improvement in pain and function than with plasma alone.	3
Steunebrink 2013 Netherlands[605]	RCT	*N* = 33 % female 24.2 Age 32.9 (10) Symptoms 11 (8) Training status Recreational	2	1× 'Exercise only'; 1× 'Exercise, Non-Active'	Continuous topical GTN treatment in addition to an eccentric exercise programme does not improve clinical outcome compared to placebo patches and an eccentric exercise programme in patients with chronic patellar tendinopathy.	1a, 1b, 1c, 3
Pearson 2018 Australia[526]	RCT	*N* = 16 % female 0 Age 28 (4.25) Symptoms 34.17 (1.95) Training status Performance	2	2× 'Exercise only'	Pain was significantly reduced after isometric loading on both SLDS and hop tests. Pain and quadriceps function improved over the 4 weeks. Short-duration isometric contractions are found to be as effective as longer duration contractions for relieving patellar tendon pain when total time under tension is equalised.	1a, 1c, 3
Visnes 2005 Norway[129]	RCT	*N* = 29 % female 38.5 Age 26.58 (NR) Symptoms 73.6 (62.3) Training status Performance	2	1× 'Exercise only'; 1× 'Non-Active'	There was no effect on knee function (VISA) from a 12-week programme with eccentric training among a group of volleyball players with patellar tendinopathy who continued to train and compete during the treatment period. Whether the training would be effective if the patients did not participate in sports activity is not known.	1a, 1c, 3
Thijs 2017 Netherlands[621]	RCT	*N* = 52 % female 29 Age 28.6 (6.7) Symptoms 19.5 (24.7) Training status Recreational	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	There was no additional effect of 3 sessions of ESWT in participants with PT treated with eccentric exercises as no significant differences for primary and secondary outcomes were found.	3
Young 2005 Australia[132]	RCT	*N* = 17 % female 23.5 Age 27.3 (1.8) Symptoms NR Training status Performance	2	2× 'Exercise only'	Both exercise protocols improved pain and sporting function in volleyball players over 12 months. The decline squat protocol offers greater clinical gains during a rehabilitation programme for patellar tendinopathy in athletes who continue to train and play with pain.	1a, 1c, 2, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Abat 2016 Spain[213]	RCT	*N* = 60 % female 21.7 Age 31.0 (6.2) Symptoms 29.2 (32.0) Training status Recreational	2	2× 'Exercise, Electro-Therapy'	Combining USGET and eccentric exercise resulted in better outcomes for patellar tendinopathy patients than using conventional electrophysiotherapy techniques.	3
Rosety-Rodriguez 2006 Spain[560]	Quasi-experimental	*N* = 46 % female 0.0 Age NR Symptoms NR Training status Other	2	2× 'Exercise, Electro-Therapy, Manual-Therapy'	Conservative treatment based on decline eccentric programme showed better results than standard squat programme.	3
Lee 2017 Hong Kong, China (SAR)[459]	RCT	*N* = 28 % female 0.0 Age 22.6 (3.4) Symptoms 33.5 (26.2) Training status Recreational	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	Eccentric exercise-induced modulation on tendon mechanical properties and clinical symptoms is associated in athletes with patellar tendinopathy.	3
Rio 2017 Australia[167]	RCT	*N* = 20 % female 10.0 Age 22.5 (4.7) Symptoms NR Training status Performance	2	2× 'Exercise only'	Both isometric and isotonic contraction protocols appear efficacious for in-season athletes to reduce pain; however, isometric contractions demonstrated significantly greater immediate analgesia throughout the 4-week trial.	1a, 1c, 3
Jonsson 2005 Sweden[186]	RCT	*N* = 15 % female 13.3 Age 24.9 (8.2) Symptoms 17.5 (13.2) Training status Performance	2	2× 'Exercise only'	Eccentric, but not concentric, quadriceps training on a decline board seems to reduce pain in jumper's knee.	1a, 1b, 1c, 2, 3
Dimitrios 2012 Greece[330]	Quasi-experimental	*N* = 60 % female 36.7 Age 47.6 (5.9) Symptoms 4.5 (NR) Training status Other	2	2× 'Exercise only'	Eccentric training and static stretching exercises are superior to eccentric training alone to reduce pain and improve function in patients with patellar tendinopathy at the end of the treatment and at follow-up.	1a, 1b, 1c, 2, 3
Breda 2020 Netherlands[696]	RCT	*N* = 76 % female 23.7 Age 24 (3.9) Symptoms 98.5 (NR) Training status Performance	2	2× 'Exercise only'	In patients with patellar tendinopathy, progressive tendon-loading exercises resulted in a significantly better clinical outcome after 24 weeks than eccentric exercise therapy. Progressive tendon-loading exercises are superior to eccentric exercise therapy and are therefore recommended as initial conservative treatment for patellar tendinopathy.	1a, 1b, 1c, 2, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Lee 2017 Hong Kong, China (SAR)[697]	RCT	*N* = 34 % female 0.0 Age 22.6 (3.4) Symptoms 33.6 (26.2) Training status Performance	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	Eccentric exercise alone was effective in increasing tendon strain and reducing pain. The addition of ESWT did not provide any further benefits.	3
Rotator cuff						
Hallgren 2014 Sweden[383]	RCT	*N* = 50 % female 37.0 Age 52 (30–65)** Symptoms 18 (6–186)* Training status Other	4	2× 'Exercise only';2× 'Exercise, Surgery'	Specific exercises produced positive short-term improvements at 1-year follow-up and reduced the need for surgery. Full-thickness tear and a low CMS score appear to be predictors of poor outcome.	1a, 1c, 2, 3
Pekyavas 2016 Turkey[527]	RCT	*N* = 70 % female NR Age 47.1 (13.8) Symptoms NR Training status Other	4	1× 'Exercise only';1× 'Exercise, Kinetics';1× 'Exercise, Kinetics, Manual-Therapy'; 1× 'Exercise, Electro-Therapy, Kinetics, Manual-Therapy'	HILT and MT were found to be more effective in reducing pain and disability and improving ROM in patients with SAIS.	1a, 1c, 3
Hallgren 2017 Sweden[258]	RCT	*N* = 108 % female 34.1 Age 58 (NR) Symptoms NR Training status Other	4	2× Exercise only'; 2× 'Exercise, Surgery'	More patients in the specific exercise group managed to avoid surgery compared to the unspecific exercise group at 5-year follow-up, supporting its prescription as an initial treatment for patients with subacromial pain.	1a, 1c, 2, 3
Polimeni 2003 Italy[698]	RCT	*N* = 50 % female 72.0 Age 56 (16) Symptoms NR Training status Other	4	1× 'Exercise only'; 3× 'Exercise, Electro-Therapy'	All patients experienced improvement with treatment, but the association of physical therapy and functional rehabilitation did not seem to lead to added benefit for the patient.	1a, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Faria 2006 Portugal[354]	Quasi-experimental	*N* = 103 % female NR Age 52.5 (NR) Symptoms NR Training status Other	3	1× 'Exercise, Manual-Therapy'; 2× Exercise, Electro-Therapy, Manual-Therapy'	All treatment groups effectively reduced pain. However, it is not clear whether the significant differences observed between groups could be due to factors other than the primary intervention in the absence of randomisation.	3
Brox 1999 Norway[269]	RCT	*N* = 125 % female 44.0 Age 47.6 (23–66)** Symptoms NR Training status Other	3	1× 'Exercise, Surgery'; 1× 'Non-Active'; 1× Exercise only'	At 2.5 years follow-up, both arthroscopic surgery and supervised exercises are better treatments than placebo with no significant difference between the two active treatments.	1a, 1b, 3
Pérez-Merino 2016 Spain[529]	RCT	*N* = 99 % female 56.3 Age 54.4 (9.4) Symptoms 7.4 (7.7) Training status Other	3	3× 'Exercise, Electro-Therapy'	Ultrasound, iontophoresis with dexketoprofen and phonophoresis with dexketoprofen can improve pain, shoulder function and physical functioning and symptoms in the upper limb in patients with SIS without a complete tear of the rotator cuff.	3
Ludewig 2003 United States[463]	RCT	*N* = 85 % female 0.0 Age 48.8 (2.1) Symptoms NR Training status Other	3	1× 'Exercise only'; 2× 'Non-Active'	HEPs are more effective in reducing symptoms and improving function (Shoulder Rating Questionnaire, shoulder satisfaction score) compared to the control group in construction workers with shoulder pain.	1a, 1b, 3
Paavola 2018 Finland[516]	RCT	*N* = 186 % female 69.8 Age 50.6 (5.0) Symptoms 19.5 (18.9) Training status N R	3	1× 'Exercise only'; 2× 'Non-Exercise only'	Arthroscopic subacromial decompression provided no benefit over diagnostic arthroscopy in patients with shoulder impingement syndrome.	1a, 1b, 3
Calis 2011 Turkey[273]	RCT	*N* = 52 % female 67.3 Age 49.2 (12.6) Symptoms 3.0 (1–24)** Training status Other	3	2× 'Exercise, Electro-Therapy'; 1× 'Exercise only'	Ultrasound and laser treatments were not superior to each other in the treatment of SIS.	1a, 3
Melegati 2000 Italy[480]	RCT	*N* = 90 % female 65.5 Age 54.4 (3.0) Symptoms NR Training status Other	3	1× 'Exercise only'; 1× 'Exercise, Electro-Therapy'; 1× 'Non-Active'	Groups A (kinesitherapy) and B (ESWT + kinesitherapy) achieved a significant constant score improvement, whereas the increase in group C (control) was not significant.	1a, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Tahran 2020 Turkey[618]	RCT	*N* = 67 % female 30.5 Age 52.9 (11.0) Symptoms NR Training status Other	3	2× 'Exercise only'; 1× 'Exercise, Electro-Therapy'	All treatments improved pain, shoulder mobility, function and disability in patients with SIS. However, modified posterior shoulder stretching exercises in addition to a treatment programme was superior to the treatment programme alone in improving pain with activity, internal rotation ROM and dysfunction. Moreover, stretching provided clinically significant improvements.	1a, 3
Land 2019 Australia[452]	RCT	*N* = 60 % female 50.0 Age 51.0 (5.3) Symptoms 8.5 (4.0) Training status Other	3	2× 'Exercise, Manual-Therapy'; 1× 'Non-Exercise only'	Upper thoracic and posterior shoulder interventions with a targeted home exercise that addresses thoracic spine or posterior shoulder tightness improves the signs and symptoms of SIS.	3
García 2016 Spain[362]	RCT	*N* = 78 % female 60.1 Age 58.8 (14.2) Symptoms NR Training status Other	3	1× 'Exercise, Non-Active'; 2× 'Exercise, Electro-Therapy, Non-Active'	In patients with impingement syndrome, a combination of ultrasonophoresis and an exercise programme is better than a combination of iontophoresis and the same exercise programme or the exercise programme alone.	3
Devereaux 2016 Canada[326]	RCT	*N* = 100 % female 37.9 Age 48.0 (11.9) Symptoms NR Training status Other	3	1× 'Exercise, Kinetics'; 2× 'Exercise only'	The improvements in pain and function observed with an NSAID or precut kinesiology tape as adjuvant treatments were no greater than with rehabilitation exercise alone.	1a, 1b, 3
Heron 2017 United Kingdom[390]	RCT	*N* = 120 % female 41.0 Age 49.9 (NR) Symptoms NR Training status Other	3	3× 'Exercise only'	Open chain, closed chain, and range of movement exercises all seem to be effective in bringing about short-term changes in pain and disability in patients with rotator cuff tendinopathy.	1a, 1c, 2, 3
Walther 2004 Germany[161]	RCT	*N* = 60 % female 43.3 Age 50.7 (NR) Symptoms 27.3 (NR) Training status Other	3	2× 'Exercise only'; 1× 'Non-Exercise only'	There were no statistically significant differences among the groups. Guided self-training can lead to results similar to those of conventional physiotherapy.	1a, 1c, 2, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Maenhout 2013 Belgium[464]	RCT	*N* = 61 % female 59.0 Age 39.8 (13.0) Symptoms NR Training status Other	2	2× 'Exercise only'	Adding heavy-load eccentric training resulted in a higher gain in isometric strength at 90 degrees of scapular abduction, but was not superior for decreasing pain and improving shoulder function. The addition of a limited number of physiotherapy sessions combined with a daily HEP is highly effective in patients with impingement.	1a, 1c, 2, 3
Nazligul 2018 Turkey[493]	RCT	*N* = 65 % female 56.6 Age 50.0 (9.1) Symptoms 4.7 (25.1) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	IFC therapy had no additional benefit over NSAID, cryo-therapy and exercise programme in the treatment of SIS.	3
Ellegaard 2016 Denmark[342]	RCT	*N* = 99 % female 59.0 Age 48.5 (13.1) Symptoms NR Training status Other	2	2× 'Exercise, Injection'	10 weeks of unilateral exercise as an adjunct to subacromial steroid injections did not improve the primary outcome of shoulder pain due to SAPS and enlarged subacromial bursa, compared to exercise.	3
Dogan 2010 Turkey[333]	RCT	*N* = 52 % female 63.5 Age 53.6 (11.3) Symptoms 13.2 (21.2) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	Laser therapy was no more effective than placebo laser.	3
Engebretsen 2009 Norway[344]	RCT	*N* = 104 % female 50.0 Age 48.0 (10.6) Symptoms 12.5 (NR) Training status Other	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Supervised exercises are superior to ESWT in terms of shoulder pain, disability and some work-related outcomes.	1a, 1b, 3
Kromer 2014 Germany[445]	RCT	*N* = 90 % female 51.1 Age 51.8 (11.2) Symptoms 24.1 (35.1) Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Exercise only'	The use of MT including physiotherapy provides no additional benefits and is more expensive in comparison to exercise only interventions.	1a, 1c, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Seven 2017 Turkey[583]	RCT	*N* = 101 % female 45.5 Age 48.5 (11.6) Symptoms 19.5 (12.4) Training status Other	2	1× 'Exercise, Injection'; 1× 'Exercise only'	Prolotherapy is an easily applicable treatment which may be superior in enhancing pain and function outcomes in comparison to exercise alone.	1a, 1b, 3
Engebretsen 2011 Norway[345]	RCT	*N* = 104 % female 50.0 Age 48.0 (10.6) Symptoms 12.5 (NR) Training status Other	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Both radial ESWT and the supervised exercise regime devised by Bohmer (1998) provided similar benefits in pain and function-related outcomes. However, exercise may be superior for work-related outcomes.	1a, 1b, 3
Conroy 1998 United States[298]	RCT	*N* = 14 % female 71.4 Age 52.8 (13.4) Symptoms NR Training status Other	2	2× 'Exercise, Manual-Therapy'	Both groups improve mobility and function in shoulder impingement syndrome but only joint mobilisation relieves pain over a 24-hour period.	3
Celik 2009 Turkey[278]	Quasi-experimental	*N* = 56 % female 71.4 Age 50.0 (NR) Symptoms NR Training status Other	2	1× 'Exercise, Electro-Therapy, Injection, Manual-Therapy'; 1× 'Exercise, Electro-Therapy, Manual-Therapy'	Despite initial short-term pain relief from injection, both groups demonstrated improvements at 3 and 6 weeks.	3
Başkurt 2011 Turkey[246]	Quasi-experimental	*N* = 40 % female 67.5 Age 51.4 (10.0) Symptoms NR Training status Other	2	2× 'Exercise only'	Scapular stabilisation combined with stretching and strengthening exercises can be more effective in the short term for SIS.	1a, 2, 3
Celik 2009 Turkey[279]	Quasi-experimental	*N* = 30 % female 76.0 Age 52.0 (34–70)** Symptoms NR Training status Other	2	2× 'Exercise, Electro-Therapy'	Both groups had significant improvements in pain and disability measures; however, exercise programme within pain-free ROM showed additional improvements in VAS and face scores in SIS.	3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Yeldan 2009 Turkey[672]	Quasi-experimental	*N* = 60 % female 78.0 Age 55.2 (8.7) Symptoms 6.5 (4.6) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	No significant difference between LLLT and placebo LLLT when they are supplementing an exercise programme for treatment of shoulder impingement syndrome.	3
Ingwersen 2017 Denmark[191]	RCT	*N* = 100 % female 46.0 Age 46.1 (10.3) Symptoms 12 (NR) Training status Other	2	2× 'Exercise, Injection'	No superior benefit of PHLE was seen when compared with LLE in primary or secondary outcomes.	3
Arias-Buría 2015 Spain[230]	RCT	*N* = 36 % female 75.0 Age 57.5 (6.4) Symptoms 10.9 (2.6) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise only'	Ultrasound-guided percutaneous electrolysis combined with eccentric exercises resulted in better short-term outcomes compared to eccentric exercises alone.	1a, 1c, 3
Blume 2015 United States[699]	RCT	*N* = 34 % female 58.0 Age 49.4 (15.6) Symptoms 22.7 (24.3) Training status Other	2	2× 'Exercise only'	Both eccentric and concentric PRE programmes resulted in improved function, AROM and strength in patients with SAIS. However, no difference was found between the two exercise modes, suggesting that therapists may use exercises that utilise either exercise mode in their treatment of SAIS.	1a, 1c, 2, 3
Chary-Valckenaere 2018 France[283]	RCT	*N* = 185 % female 52.0 Age 54.0 (10.6) Symptoms 76.4 (79.8) Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Non-Active'	Spa therapy consisting of mineral water baths and mud applications together with supervised self-mobilisation in a thermal pool provided significant benefit in pain, function and QoL in patients with chronic shoulder pain compared to usual care.	3
Boudreau 2019 Canada[262]	RCT	*N* = 42 % female 52.4 Age 42.9 (12.0) Symptoms 43.0 (46.6) Training status Other	2	2× 'Exercise only'	No additional benefit was found to adding coactivation to regular rotator cuff strengthening exercises at 6 weeks.	1a, 1c, 3
Kim 2017 Korea (Republic of)[431]	RCT	*N* = 40 % female 72.5 Age 51.1 (10.6) Symptoms NR Training status Other	2	2× 'Exercise only'	The use of visual feedback and 3D motion images can improve pain and function in SIS.	1a, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Şimşek, 2013 Turkey[591]	RCT	*N* = 38 % female 65.8 Age 51.0 (18–69)** Symptoms NR Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Findings were inconclusive and require further research.	1a, 1c, 3
Vinuesa-Montoya 2017 Spain[641]	RCT	*N* = 40 % female 26.8 Age 47.0 (9.0) Symptoms 6.2 (3.8) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Manual-Therapy'	Cervicothoracic manipulative treatment with mobilisation plus exercise therapy may improve intensity of pain and ROM compared with home exercise alone.	1a, 1c, 3
Kromer 2013 Germany[443]	RCT	*N* = 90 % female 51.1 Age 51.8 (11.2) Symptoms 7.8 (9.8) Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Exercise only'	Individually adapted exercises were effective in the treatment of patients with shoulder impingement syndrome. Individualised manual physiotherapy contributed only a minor amount to the improvement in pain intensity.	1a, 1b, 1c, 3
Şenbursa 2011 Turkey[582]	RCT	*N* = 47 % female NR Age 49.0 (9.3) Symptoms NR Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Manual-Therapy'	Supervised exercise, supervised and MT, and home-based exercise are all effective and promising treatments for patients with subacromial impingement syndrome. The addition of an initial MT may improve outcomes with exercise.	1a, 1c, 3
Marzetti 2014 Italy[472]	RCT	*N* = 48 % female 61.4 Age 62.1 (12.5) Symptoms NR Training status Other	2	2× 'Exercise only'	Neurocognitive rehabilitation is effective in reducing pain and improving function in patients with shoulder impingement syndrome, with benefits maintained for at least 24 weeks.	1a, 1b, 1c, 2, 3
Østerås 2008 Norway[511]	RCT	*N* = 61 % female 20.0 Age 44.0 (13.9) Symptoms 40.0 (8.1) Training status Other	2	2× 'Exercise only'	In patients with longstanding subacromial pain, high-dose medical exercise therapy had better outcomes than low-dose.	3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Arias-Buría 2017 Spain[229]	RCT	*N* = 50 % female 26.0 Age 48.5 (5.5) Symptoms 71.9 (21.6) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Manual-Therapy'	This study found that the inclusion of two sessions of TrP-DN in an exercise programme was effective for improving shoulder pain-related disability at short, medium and long term; however, no greater improvement in shoulder pain was observed.	1a, 1b, 1c, 3
Vallés-Carrascosa 2018 Spain[638]	RCT	*N* = 22 % female 54 Age 59.0 (58.5–70.0)* Symptoms Training status Other	2	2× 'Exercise only'	Both rotator cuff eccentric exercise protocols with scapular stabilising and stretching of upper trapezius were equally effective in improving pain, function, and active ROM in the short term in patients with subacromial syndrome.	1a, 1c, 3
Østerås 2010 Norway[514]	RCT	*N* = 61 % female 20.5 Age 43.9 (13) Symptoms 40.2 (56.3) Training status Other	2	2× 'Exercise only'	In long-term subacromial pain syndrome, high-dosage medical exercise therapy is superior to a conventional low-dosage exercise programme.	1a, 1c, 3
Mulligan 2016 United States[489]	RCT	*N* = 50 % female 65 Age 50.1 (10.7) Symptoms 7.9 (7.4) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Manual-Therapy'	Patients with SAIS demonstrate improvement in pain and function with a standardised programme of physical therapy regardless of group exercise sequencing.	1a, 1b, 1c, 3
Yazmalar 2016 Turkey[671]	RCT	*N* = 50 % female 44 Age 51.9 (21.5) Symptoms 12.9 (13) Training status Other	2	1× 'Exercise, Electro-Therapy';1× 'Exercise, Non-Active'	Transcutaneous electrical nerve stimulation and exercise are effective on pain, disability and sleep disturbance but may not be effective on other psychosocial measures like anxiety, depression and fatigue in patients with SIS.	3
Bennell 2010 Australia[188]	RCT	*N* = 120 % female 46.7 Age 60.1 (11.3) Symptoms 19 Training status Other	2	1× 'Exercise, Kinetics, Manual-Therapy'; 1× 'Non-Active'	Immediately after the intervention, active treatment produced similar benefits on shoulder pain and function compared with a realistic placebo. However, significant improvements in pain and function were found in favour of active treatment at follow-up.	3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Kang 2019 Taiwan[416]	RCT	*N* = 34 % female 70.6 Age 47.6 (11.4) Symptoms Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Four weeks of strengthening and stretching exercises with or without kinesiology taping improved functional performance in subjects with SIS and RSP. Kinesiology taping did not demonstrate an additional effect on RSP.	3
Dupuis 2018 Canada[339]	RCT	*N* = 43 % female 55.8 Age 33.3 (11.7) Symptoms 0.9 (0.3) Training status Other	2	2× 'Exercise only'	Both groups showed statistically significant improvements on symptoms and function at 2 weeks and 6 weeks but there was no difference between the short-term effect of cryotherapy and a gradual reloading exercise programme.	1a, 1b, 1c, 2, 3
Santamato 2016 Italy[570]	RCT	*N* = 30 % female 53.3 Age 40.2 (5) Symptoms 7.5 (3.9) Training status Other	2	1× 'Non-Exercise only'; 1× 'Exercise, Electro-Therapy'	In subjects with SAIS, combined administration of focussed ESWT and IE for the rotator cuff resulted in greater reduction of pain, as well as superior functional recovery and muscle endurance in the short to medium term, compared with ESWT alone.	3
Holmgren 2012 Sweden[393]	RCT	*N* = 97 % female 37.1 Age 52 (8.5) Symptoms 18 Training status Other	2	1× 'Exercise, Injection, Manual-Therapy'; 1× 'Exercise, Injection'	Specific exercise strategy focussing on strengthening eccentric exercises for the rotator cuff and concentric/eccentric exercises for the scapula stabilisers is effective in reducing pain and improving shoulder function in patients with persistent subacromial impingement syndrome. By extension, this exercise strategy reduces the need for arthroscopic subacromial decompression at 3 months.	3
Menek 2019 Turkey[482]	RCT	*N* = 30 % female 40 Age 51 (5.5) Symptoms Training status Other	2	2× 'Exercise, Electro-Therapy'	Mulligan mobilisation was more effective than general treatment methods for pain as well as normal joint motion, DASH scoring and some parameters of SF-36 compared with general treatment methods.	3
Juul-Kristensen 2019 Denmark[412]	RCT	*N* = 58 % female 51 Age 42.9 (12.4) Symptoms NR Training status Other	2	2× 'Exercise only'	Electromyography-biofeedback neuromuscular shoulder exercises and neuromuscular shoulder exercises were both effective in reducing pain to a clinically relevant level, while electromyography biofeedback did not make a difference. The current neuromuscular shoulder exercise protocol is recommended.	1a, 2, 3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Aktas 2007 Turkey[220]	RCT	*N* = 40 % female 75 Age 51.3 (10.4) Symptoms 4.8 (3.6) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	Electromagnetic therapy did not provide additional benefit in acute phase rehabilitation programme of SIS.	3
Akkaya 2016 Turkey[218]	RCT	*N* = 34 % female 67.6 Age 41.7 (8.9) Symptoms 6.9 (4.1) Training status Other	2	2× 'Exercise only'	Weighted and unweighted solo pendulum exercises achieved significant clinical improvements but showed no differences in ultrasonographic acrohumeral distance measurements between groups.	1a, 3
Jasnauskaitė-Gedrimė 2018 Lithuania[401]	RCT	*N* = 30 % female 43.3 Age 43.4 (12.6) Symptoms Training status Other	2	2× 'Exercise, Manual-Therapy'	Visual feedback exercises had greater effect on shoulder functions and the QoL compared to auditory feedback exercises.	3
Belley 2018 Canada[164]	RCT	*N* = 40 % female 45 Age 45.5 (10) Symptoms 9.0 (NR) Training status Other	2	1× 'Exercise, Electro-Therapy, Manual-Therapy'; 1× 'Exercise, Manual-Therapy, Non-Active'	Results do not demonstrate any improved treatment outcomes from the addition of anodal transcranial direct-current stimulation during a rehabilitation programme for individuals with rotator cuff tendinopathy.	3
Johansson 2005 Sweden[405]	RCT	*N* = 85 % female 69.4 Age 49 (7.5) Symptoms NR Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Electro-Therapy'	Acupuncture was more effective than ultrasound when applied in addition to home exercises.	1a, 1c, 3
Aceituno-Gómez 2019 Spain[215]	Quasi-experimental	*N* = 43 % female 60.9 Age 59 (8.9) Symptoms NR Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise only'	High-intensity laser therapy plus exercise did not give greater improvements in pain and functionality in patients with subacromial syndrome than exercise alone.	1a, 1b, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Kim 2020 Korea (Republic of)[433]	RCT	*N* = 40 % female 100 Age 46.2 (4.6) Symptoms NR Training status Other	2	1× 'Exercise only'; 1× 'Non-Exercise only'	Both the Neurac modality and MT induced pain relief, improved function and increased ROM. The Neurac intervention also resulted in a significant enhancement of shoulder muscle strength, indicating its superiority as an effective therapeutic modality for this particular patient group.	1a, 1b, 3
Dejaco 2017 Netherlands[44]	RCT	*N* = 36 % female 47.3 Age 49.5 (11.3) Symptoms 19.7 (20.1) Training status Other	2	2× 'Exercise only'	12-week-isolated eccentric training programme of the RC is beneficial for shoulder function and pain after 26 weeks in patients with RC tendinopathy. However, it is no more beneficial than a conventional exercise programme for the RC and scapular muscles.	1a, 1c, 2, 3
Akyol 2012 Turkey[221]	RCT	*N* = 40 % female 75.0 Age 59.2 (10.4) Symptoms 12.3 (13.5) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Non-Active'	No statistically significant difference was found between the groups. As it is effective, superficial heat and exercise programme may be a preferable treatment for SIS.	3
Bang 2000 United States[239]	RCT	*N* = 50 % female 42.3 Age 43 (9.1) Symptoms 5 (3.3) Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Exercise only'	Manual physical therapy applied by experienced physical therapists combined with supervised exercise in a brief clinical trial is better than exercise alone for increasing strength, decreasing pain and improving function in patients with shoulder impingement syndrome.	1a, 3
Bae 2011 Korea (Republic of)[234]	Quasi-experimental	*N* = 35 % female 65.7 Age 49.1 (4.9) Symptoms Training status Other	2	1× 'Exercise only'; 1× 'Non-Exercise only'	The motor control and strengthening programme improved pain, function, strength and ROM.	1a, 3
Gürsel 2004 Turkey[377]	RCT	*N* = 33 % female 39.5 Age 54.1 (8.9) Symptoms 8.4 (9.7) Training status Other	2	1× 'Exercise, Electro-Therapy'; 1× 'Exercise, Electro-Therapy, Non-Active'	There is no added benefit to the use of 1-MHz ultrasound in combination with other interventions in the management of painful shoulder conditions to merit its wide use.	3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Østerås 2009 Norway[512]	RCT	*N* = 56 % female 70.6 Age 44 (13) Symptoms 40.2 (56.3) Training status Other	2	2× 'Exercise only'	There is a dose–response effect when using active graded exercises to treat patients with long-standing subacromial pain.	1b, 3
Ketola 2009 Finland[426]	RCT	*N* = 134 % female 62.9 Age 47.1(23.3–60.0)** Symptoms 2.6 (NR) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Surgery'	Arthroscopic acromioplasty provides no clinically important effects over a structured and supervised exercise programme alone in terms of subjective outcome or cost-effectiveness when measured at 24 months.	1a, 1c, 3
de Miguel Valtierra 2018 Spain[312]	RCT	*N* = 48 % female 54 Age 54 (7) Symptoms 11.9 (12.5) Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Exercise, Electro-Therapy, Manual-Therapy'	Inclusion of ultrasound-guided percutaneous electrolysis in a treatment approach including MT and exercise resulted in no significant differences in shoulder-related disability and pressure pain sensitivity in subjects with subacromial pain syndrome.	3
Granviken 2015 Norway[374]	RCT	*N* = 44 % female 48 Age 47.9 (9.9) Symptoms 14.5 Training status Other	2	2× 'Exercise only'	No significant differences in pain and disability were found between home exercises and supervised exercises of more than the first session of a 6-week exercise regime for people with subacromial impingement.	1a, 1b, 3
Rhon 2014 United States[700]	RCT	*N* = 98 % female 32 Age 41.0 (12.0) Symptoms 5.7 (9.15) Training status Other	2	1× Exercise, Manual-Therapy'; 1× 'Exercise, Injection'	Both groups experienced significant improvement. The manual physical therapy group used less 1-year SIS-related health care resources than the corticosteroid injections group	3
McGee 1999 United States[701]	RCT	*N* = 15 % female 7.1 Age 36.4 (12.9) Symptoms NR Training status Other	2	2× 'Exercise, Electro-Therapy'	In conclusion, following 6 weeks of physical therapy treatment, patients with shoulder impingement are stronger, less limited in their activities of daily living, and appear to require less medication. Addition of closed kinetic chain exercise to physical therapy treatments does not appear to affect patient outcomes.	3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Cha 2014 Korea (Republic of)[702]	RCT	*N* = 30 % female 0.0 Age 21.9 (1.8) Symptoms 5.6 (1.3) Training status Performance	2	1× 'Exercise, Electro-Therapy'; 1× 'Non-Active'	A12-week rehabilitation programme reduced the shoulder pain, improved the body composition and enhanced the isokinetic shoulder internal/external rotators in EG with impingement symptoms.	3
Littlewood 2016 United Kingdom[34]	RCT	*N* = 60 % female 50.3 Age 54.7 (NR) Symptoms 14.6 (NR) Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Manual-Therapy'	Self-management programmes based on a single exercise were comparable to usual physiotherapy in the short, mid and long term.	1a, 1c, 3
Rodríguez-Huguet 2020 Spain[693]	RCT	*N* = 102 % female 37.5 Age 40.0 (9.9) Symptoms NR Training status Other	2	1× 'Exercise, Manual-Therapy'; 1× 'Exercise, Electro-Therapy'	Percutaneous electrolysis seems to be more effective than trigger-point dry needling in relieving pain and improving ROM and pressure pain threshold supraspinatus values in patients with supraspinatus tendinopathy, both right after treatment and at 1-year follow-up.	3
de Oliveira 2020 Canada[703]	RCT	*N* = 52 % female 42.3 Age 30.2 (8.3) Symptoms 22.6 (26.7) Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise only'	Whereas symptoms, functional limitations, ROM and AHD improved in both groups, the addition of KT did not lead to superior outcomes compared with exercise-based treatment alone, in the mid and long term, for individuals with RCRSP.	1a, 1b, 3
Buyuksireci 2020 Turkey[704]	RCT	*N* = 46 % female 65 Age 34.6 (8.5) Symptoms 5.0 (NR) Training status Other	2	2× 'Exercise, Electro-Therapy'	Adding dexamethasone iontophoresis to physiotherapy for patients with subacromial impingement syndrome seems to provide a better clinical and functional improvement.	3
Beaudreuil 2012 France[705]	RCT	*N* = 62 % female 68 Age 58.7 (10.4) Symptoms 28.3 (54.6) Training status Other	2	2× 'Exercise, Manual-Therapy'	At 3 months, pain-free ROM, both flexion and abduction, was greater in the DHC group than in the mobilisation group. The number of patients with painful arc during flexion was decreased in the dynamic humeral centring group.	3

continued

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Ketola 2013 Finland[706]	RCT	*N* = 140 % female 62.9 Age 41.7 Symptoms Training status Other	2	1× 'Exercise only'; 1× 'Exercise, Surgery'	Differences in the patient-centred primary and secondary parameters between the two treatment groups were not statistically significant, suggesting that acromioplasty is not cost-effective.	1a, 3
Pekgöz 2020 Turkey[707]	RCT	*N* = 40 % female 55 Age 43.6 (7.8) Symptoms Training status Other	2	1× 'Non-Exercise only'; 1× 'Exercise, Electro-Therapy'	Mobilisation and supervised exercise yield comparable outcomes in patients with SAIS. Patient satisfaction was similar in both groups.	3
Koç 2020 Turkey[708]	RCT	*N* = 90 % female 58.9 Age 48.1 (8.8) Symptoms 1.8 (0.6) Training status Other	2	2× 'Exercise, Electro-Therapy'	The addition of balneotherapy to physical therapy for subacute supraspinatus tendinopathy can make additional contributions to shoulder ROM, pain, handgrip strength, functional status and QoL.	3
Hotta 2020 Brazil[709]	RCT	*N* = 60 % female 70 Age 49 (9) Symptoms 28.5 (24) Training status Other	2	2× 'Exercise only'	The inclusion of the isolated scapular stabilisation exercises, emphasising retraction and depression of the scapula, to a progressive general periscapular strengthening protocol did not add benefits to self-reported shoulder pain and disability, muscle strength and ROM in patients with subacromial pain syndrome.	1a, 1b, 1c, 2, 3
Chaconas 2017 United States[710]	RCT	*N* = 46 % female 41.7 Age 45.9 (17.4) Symptoms 49.1 (80) Training status Other	2	2× 'Exercise only'	An eccentric programme targeting the external rotators was superior to a general exercise programme for strength, pain and function after 6 months. The findings suggest eccentric training may be efficacious to improve self-report function and strength for those with SAPS.	1a, 1b, 1c, 2, 3
Werner 2002 Germany[658]	RCT	*N* = 20 % female 50 Age 51.75 (NR) Symptoms 27.5 Training status Other	2	2× 'Exercise only'	Strengthening of the centring muscles around the humeral head led to positive outcomes for subacromial impingement. Self-training after instruction showed no difference to physiotherapist-supervised exercises.	1a, 1b, 1c, 2, 3

TABLE 37 Effectiveness review table of included studies (*continued*)

Study	Design	Participants (number (n); sex (% female); mean (sd) age; mean (sd) symptom duration in months)	TAs	Treatment classes	Findings	Review included
Cheng 2007 Hong Kong, China (SAR)[286]	RCT	*N* = 94 % female Age 32.4 (10.2) Symptoms 23.4 Training status Other	2	2× 'Exercise only'	An eccentric programme targeting the external rotators was superior to a general exercise programme for strength, pain and function after 6 months. The findings suggest eccentric training may be efficacious to improve self-report function and strength for those with subacromial pain syndrome.	1a, 1c, 3
Tibialis posterior						
Kulig 2009 United States[448]	RCT	*N* = 36 % female 77.8 Age 52 (15.4) Symptoms 30.6 (52) Training status Other	3	3× 'Exercise, Kinetics'	People with early-stage tibialis posterior tendinopathy benefited from a programme of orthosis wear and stretching. Eccentric and concentric progressive resistive exercises further reduced pain and improved perceptions of function.	3
Bek 2012 Turkey[250]	Quasi-experimental	*N* = 49 % female Age 30.7 (16) Symptoms Training status Other	2	1× 'Exercise, Kinetics'; 1× 'Exercise, Electro-Therapy, Kinetics, Manual-Therapy'	While supervised, patient-selective programme may provide better improvement in tibialis posterior strength than home-based rehabilitation, both programmes seem to be effective in relieving pain and improving functional outcome in patients with Grade 1–3 PTTD.	3
Houck 2015 United States[397]	RCT	*N* = 38 % female 77.8 Age 57.5 (10.6) Symptoms Training status Other	2	2× Exercise, Kinetics'	A moderate-intensity, home-based exercise programme minimally improves outcomes over orthosis wear alone in participants with stage II tibialis posterior tendon dysfunction. The improvements observed were smaller than those reported in some previous controlled and uncontrolled clinical trials, suggesting that positive effects on function and pain in response to exercise may require higher intensity than this home-based programme for participants with tibialis posterior tendon dysfunction.	3
Jeong 2008 Korea (Republic of)[711]	RCT	*N* = 12 % female 100 Age 52.9 (14.4) Symptoms Training status Other	2	1× 'Exercise only'; 1× 'Non-Active'	A 6-week stretching and strengthening exercise programme significantly reduced pain compared to the control group and only the dorsiflexion was significantly increased in the exercise group in the analysis of ROM.	3

* = median (interquartile range); ** = mean (range); *** = mean (standard error of the mean). HVI, high-volume injection; HSR. heavy slow resistance training; SAIS. Subacromial impingement syndrome; SIS. Shoulder impingement syndrome; HILT. high-intensity laser therapy; IFC. interferential current; SAPS. subacromial pain syndrome; LLE. low-load exercise; AROM. active range of motion; PRE. progressive resistance exercise.

Appendix 6 Effectiveness review strength of evidence and risk of bias assessments

This appendix provides a summary of the risk of bias results for each review, the distribution of data across the outcomes and tendinopathy locations in the featured analyses, and the associated strength of evidence assessment.

Effectiveness review 1A

TABLE 38 Effectiveness review 1A: Risk of bias results for the 115 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Aceituno-Gómez *et al.* 2019[215]	Low risk	Unclear	Low risk	Low risk	Low risk	Low risk	High risk
Akkaya *et al.* 2016[218]	Low risk	Unclear	High risk	High risk	Low risk	Unclear	Low risk
Alfredson *et al.* 1998[17]	High risk	Unclear	High risk	Unclear	Low risk	Unclear	High risk
Alfredson *et al.* 1999[224]	Not applicable (quasi)	Not applicable (quasi)	Not applicable (quasi)	Not applicable (quasi)	Low risk	Unclear	High risk
Arias-Buría *et al.* 2015[230]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Arias-Buría *et al.* 2017[229]	Low risk	Low risk	Unclear	Low risk	Unclear	Low risk	High risk
Bae *et al.* 2011[234]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Unclear	Unclear	Unclear	High risk
Bahr *et al.* 2006[131]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Balius *et al.* 2016[238]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Bang *et al.* 2000[239]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	Low risk
Başkurt *et al.* 2011[246]	Low risk	Unclear	High risk	Unclear	Low risk	Unclear	Low risk
Beyer *et al.* 2015[18]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Blume *et al.* 2015[699]	Unclear	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Boudreau *et al.* 2019[262]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Breda *et al.* 2020[696]	Low risk	Low risk	High risk	Low risk	Low risk	High risk	High risk
Brox *et al.* 1999[269]	High risk	High risk	High risk	High risk	No data	No data	No data
Calis *et al.* 2011[273]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	Unclear
Chaconas *et al.* 2017[710]	Low risk	Unclear	Unclear	Low risk	High risk	Unclear	High risk
Cheng *et al.* 2007[286]	High risk	High risk	Unclear	Unclear	Unclear	Unclear	High risk
Cho *et al.* 2017[289]	High risk	High risk	Unclear	Unclear	Low risk	Low risk	Unclear

TABLE 38 Effectiveness review 1A: Risk of bias results for the 115 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
de Vos *et al.* 2007[59]	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk	High risk
Dejaco *et al.* 2017[44]	Low risk	Low risk	Low risk	Low risk	Low risk	High risk	Low risk
Devereaux *et al.* 2016[326]	Low risk	High risk	High risk	High risk	High risk	Unclear	Low risk
Dimitrios *et al.* 2012[330]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dimitrios *et al.* 2013[331]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dupuis *et al.*[339]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Engebretsen *et al.* 2009[344]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Engebretsen *et al.* 2011[345]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Gatz *et al.* 2020[365]	Low risk	Low risk	Low risk	Low risk	Unclear	Unclear	High risk
Giray *et al.* 2019[368]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Granviken *et al.* 2015[374]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Hallgren *et al.* 2014[383]	High risk	Low risk	High risk	Low risk	Unclear	Low risk	Low risk
Heron *et al.* 2017[390]	Low risk	Low risk	Low risk	Low risk	High risk	High risk	Low risk
Hotta *et al.* 2020[709]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Johansson *et al.* 2005[405]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	High risk
Jonsson *et al.* 2005[186]	Unclear	Unclear	Low risk	Unclear	High risk	Unclear	High risk
Jonsson 2009[408]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear

continued

TABLE 38 Effectiveness review 1A: Risk of bias results for the 115 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected *(continued)*

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Juul-Kristensen *et al.* 2019[412]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Ketola *et al.* 2009[426]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	High risk
Ketola *et al.* 2013[706]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Kim *et al.* 2017[431]	Low risk	Unclear	Unclear	Low risk	Unclear	Low risk	Low risk
Kim *et al.* 2020[433]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	High risk
Knobloch *et al.* 2007[684]	Low risk	Low risk	Unclear	Unclear	High risk	Unclear	High risk
Knobloch *et al.* 2007[192]	Unclear	Unclear	High risk	Low risk	Unclear	Unclear	High risk
Knobloch *et al.* 2008[437]	Unclear	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Kongsgaard *et al.* 2009[21]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Kromer *et al.* 2014[445]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Kromer *et al.* 2013[443]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Littlewood *et al.* 2016[34]	Low risk	Low risk	High risk	High risk	Unclear	Unclear	High risk
Ludewig *et al.* 2003[463]	Low risk	Unclear	High risk	Unclear	Low risk	Unclear	Low risk
Luginbuhl *et al.* 2008[174]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Maenhout *et al.* 2013[464]	Unclear	High risk	High risk	High risk	Low risk	Unclear	Low risk
Mafi *et al.* 2001[467]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Manias *et al.* 2006[469]	High risk	High risk	High risk	High risk	Low risk	Unclear	Unclear
Martinez-Silvestrini *et al.* 2005[471]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	High risk
Marzetti *et al.* 2014[472]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
McCormack *et al.* 2016[478]	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk	Low risk
Melegati *et al.* 2000[480]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Mulligan *et al.* 2016[489]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	High risk

TABLE 38 Effectiveness review 1A: Risk of bias results for the 115 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Nishizuka *et al.* 2017[498]	Low risk	Low risk	High risk	Unclear	Low risk	Unclear	High risk
Nørregaard *et al.* 2007[499]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Nowotny *et al.* 2018[501]	Low risk	Unclear	Low risk	Low risk	High risk	Unclear	High risk
Paavola *et al.* 2018[516]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Park *et al.* 2010[521]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Pearson *et al.* 2012[525]	Unclear	Unclear	High risk	Unclear	Low risk	Unclear	High risk
Pearson *et al.* 2018[526]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Pekyavas *et al.* 2016[527]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Low risk
Petersen *et al.* 2007[530]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Peterson *et al.* 2011[531]	Low risk	Low risk	Unclear	High risk	Low risk	Low risk	Low risk
Peterson *et al.* 2014[185]	Low risk	Unclear	Low risk	High risk	Low risk	Low risk	Low risk
Polimeni *et al.* 2003[698]	Unclear	Unclear	High risk	Low risk	Unclear	Unclear	Unclear
Praet *et al.* 2019[535]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Rabusin *et al.* 2020[686]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	High risk
Reyhan *et al.* 2020[549]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	High risk
Rio *et al.* 2017[167]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Romero-Morales *et al.* 2020[685]	Unclear	Unclear	Unclear	Unclear	Low risk	Low risk	High risk
Rompe *et al.* 2007[558]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Rompe *et al.* 2008[687]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Unclear
Rompe *et al.* 2009[557]	Unclear	Low risk	High risk	High risk	Low risk	Unclear	Low risk
Rompe *et al.* 2009[559]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Roos *et al.* 2004[193]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	Low risk

continued

TABLE 38 Effectiveness review 1A: Risk of bias results for the 115 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Şenbursa *et al.* 2011[582]	Low risk	Unclear	Unclear	Unclear	Low risk	Unclear	Low risk
Seven *et al.* 2017[583]	Low risk	Low risk	High risk	Low risk	High risk	Unclear	Low risk
Sevier *et al.* 2015[584]	Low risk	Unclear	High risk	High risk	High risk	Unclear	High risk
Stasinopoulos and Manias 2013[692]	High risk	High risk	High risk	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2006[599]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2010[601]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2017[597]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	High risk
Stefansson *et al.* 2019[184]	Low risk	Unclear	High risk	Low risk	High risk	Unclear	Low risk
Steunebrink *et al.* 2013[605]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Stevens *et al.* 2014[175]	Unclear	Unclear	High risk	High risk	Unclear	Unclear	High risk
Svernlov and Adolfsson 2001[614]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Unclear	Unclear	Unclear	High risk
Tahran *et al.* 2020[618]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	Low risk
Tonks *et al.* 2007[624]	Low risk	Low risk	Low risk	High risk	High risk	Low risk	Low risk
Turgut *et al.* 2017[633]	Low risk	Unclear	Unclear	Unclear	High risk	Unclear	Low risk
Vallés-Carrascosa *et al.* 2018[638]	Low risk	Low risk	Low risk	High risk	Low risk	Low risk	High risk

TABLE 38 Effectiveness review 1A: Risk of bias results for the 115 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
van Ark *et al.* 2016[644]	Low risk	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk
Vinuesa-Montoya *et al.* 2017[641]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
Visnes *et al.* 2005[129]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Unclear
Vuvan *et al.* 2019[187]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Walther *et al.* 2004[161]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear
Wegener *et al.* 2016[655]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	High risk
Wen *et al.* 2011[657]	Unclear	Unclear	Low risk	Unclear	High risk	Unclear	High risk
Werner *et al.* 2002[658]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Wiedmann *et al.* 2017[664]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Yelland *et al.* 2011[674]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Yerlikaya *et al.* 2018[675]	Low risk	Unclear	Low risk	Low risk	Unclear	Unclear	High risk
Young *et al.* 2005[132]	Unclear	Unclear	High risk	Low risk	High risk	Unclear	High risk
Yu *et al.* 2013[680]	Low risk	Low risk	Low risk	Unclear	Low risk	Unclear	Unclear

TABLE 39 Effectiveness review 1A: Moderator analysis: Checklist of outcomes across tendinopathy location and outcome domains

Moderator	Level	Number of studies	Number of TAs	Number of outcomes tendinopathy location	Number of outcomes outcome domain
Assessment duration	Short (≤12 weeks)	95	146	RCSP: 565; Achilles: 200; elbow: 100; patellar 61	Disability: 282; pain: 257; PFC: 197; ROM: 136; function: 44; QoL: 10
Assessment duration	Medium (13–52 weeks)	18	23	RCSP: 201; Achilles: 110; elbow: 107; patellar 27	Disability: 138; pain: 118; PFC: 104; ROM: 18; function: 28; QoL: 39
Assessment duration	Long (>52 weeks)	2	2	Achilles: 200; patellar 61	Disability: 21; pain: 21; ROM: 4; QoL: 5
Symptom duration	One year or less	34	46	RCSP: 141; Achilles: 82; elbow: 82; patellar 9	Disability: 88; pain: 108; PFC: 49; ROM: 29; function: 36; QoL: 4
Symptom duration	Two years or less	21	33	RCSP: 168; Achilles: 53; elbow: 13; patellar 24	Disability: 82; pain: 76; PFC: 30; ROM: 37; function: 15; QoL: 18
Symptom duration	Over two years	21	30	RCSP: 212; Achilles: 132; patellar 37	Disability: 119; pain: 64; PFC: 142; ROM: 48; function: 8
Supervision	Supervised	22	36	RCSP: 326; Achilles: 200; elbow: 100; patellar 61	Disability:69; pain: 83; PFC: 91; ROM: 88; function: 24; QoL: 1
Supervision	Unsupervised	82	113	RCSP: 421; Achilles: 6; elbow: 24	Disability: 326; pain: 276; PFC: 151; ROM: 68; function: 48; QoL: 49

TABLE 40 Moderator analysis: Strength of evidence assessment table

Comparison	Outcome	Overall risk of bias	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Assessment duration	Short (≤12 weeks)	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Assessment duration	Medium (13–52 weeks)	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Assessment duration	Long (>52 weeks)	Low risk	Low risk	High risk	Low risk	High risk	Low
Symptom duration	One year or less	Low risk	Low risk	High risk	Low risk	High risk	Low
Symptom duration	Two years or less	Low risk	Low risk	High risk	Low risk	High risk	Low
Symptom duration	Over two years	Low risk	Low risk	High risk	Low risk	High risk	Low
Supervision	Supervised	Low risk	Low risk	High risk	Low risk	High risk	Low
Supervision	Unsupervised	Low risk	Low risk	Low risk	Low risk	High risk	Moderate

Effectiveness review 1B

TABLE 41 Effectiveness review 1B: Risk of bias results for the 52 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Aceituno-Gómez *et al.* 2019[215]	Low risk	Unclear	Low risk	Low risk	Low risk	Low risk	High risk
Arias-Buría *et al.* 2017[229]	Low risk	Low risk	Unclear	Low risk	Unclear	Low risk	High risk
Bahr *et al.* 2006[131]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Beyer *et al.* 2015[18]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Breda *et al.* 2020[696]	Low risk	Low risk	High risk	Low risk	Low risk	High risk	High risk
Brox *et al.* 1999[269]	High risk	High risk	High risk	High risk	No data	No data	No data
Chaconas *et al.* 2017[710]	Low risk	Unclear	Unclear	Low risk	High risk	Unclear	High risk
de Vos *et al.* 2007[59]	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk	High risk
Devereaux *et al.* 2016[326]	Low risk	High risk	High risk	High risk	High risk	Unclear	Low risk
Dimitrios *et al.* 2012[330]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dupuis *et al.*[339]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Engebretsen *et al.* 2009[344]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Engebretsen *et al.* 2011[345]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Ganderton *et al.* 2018[189]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Gatz *et al.* 2020[365]	Low risk	Low risk	Low risk	Low risk	Unclear	Unclear	High risk
Granviken *et al.* 2015[374]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Hotta *et al.* 2020[709]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Jonsson 2009[408]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
Kim *et al.* 2020[433]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	High risk
Knobloch *et al.* 2007[684]	Low risk	Low risk	Unclear	Unclear	High risk	Unclear	High risk
Knobloch *et al.* 2007[192]	Unclear	Unclear	High risk	Low risk	Unclear	Unclear	High risk

TABLE 41 Effectiveness review 1B: Risk of bias results for the 52 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Knobloch *et al.* 2008[437]	Unclear	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Kongsgaard *et al.*[21]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Kromer *et al.* 2014[445]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Kromer *et al.* 2013[443]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Ludewig *et al.* 2003[463]	Low risk	Unclear	High risk	Unclear	Low risk	Unclear	Low risk
Marzetti *et al.* 2014[472]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
McCormack *et al.* 2016[478]	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk	Low risk
Mulligan *et al.* 2016[489]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	High risk
Nishizuka *et al.* 2017[498]	Low risk	Low risk	High risk	Unclear	Low risk	Unclear	High risk
Nørregaard *et al.* 2007[499]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Østerås *et al.* 2009[512]	Low risk	Low risk	Unclear	High risk	Low risk	Unclear	Low risk
Paavola *et al.* 2018[516]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Rabusin *et al.* 2020[648]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	High risk
Reyhan *et al.* 2020[686]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	High risk
Rompe *et al.* 2007[558]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Rompe *et al.* 2008[687]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Unclear
Rompe *et al.* 2009[557]	Unclear	Low risk	High risk	High risk	Low risk	Unclear	Low risk
Rompe *et al.* 2009[559]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Roos *et al.* 2004[193]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	Low risk
Seven *et al.* 2017[583]	Low risk	Low risk	High risk	Low risk	High risk	Unclear	Low risk
Sevier *et al.* 2015[584]	Low risk	Unclear	High risk	High risk	High risk	Unclear	High risk
Silbernagel *et al.* 2001[587]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk

continued

TABLE 41 Effectiveness review 1B: Risk of bias results for the 52 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected *(continued)*

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Steunebrink *et al.* 2013[605]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Stevens *et al.* 2014[175]	Unclear	Unclear	High risk	High risk	Unclear	Unclear	High risk
Tonks *et al.* 2007[624]	Low risk	Low risk	Low risk	High risk	High risk	Low risk	Low risk
van Ark *et al.* 2016[644]	Low risk	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk
Vuvan *et al.* 2019[187]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Werner *et al.* 2002[658]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Yelland *et al.* 2011[674]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk

TABLE 42 Effectiveness review 1B: Adverse event analysis: strength of evidence assessment table

Overall risk of bias	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Low risk	Low risk	Low risk	Low risk	Low risk	High

TABLE 43 Effectiveness review 1B: Patient rating analysis: proportion satisfied analysis: strength of evidence assessment table

Overall risk of bias	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Low risk	Low risk	Low risk	Low risk	Low risk	High

TABLE 44 Effectiveness review 1B: Patient perception of change (Global rating of change: GROC): strength of evidence assessment table

Overall risk of bias	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Low risk	Low risk	Low risk	Low risk	Low risk	High

Effectiveness review 1C

TABLE 45 Effectiveness review 1C: Risk of bias results for the 93 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Alfredson *et al.* 1998[17]	High risk	Unclear	High risk	Unclear	Low risk	Unclear	High risk
Alfredson *et al.* 1999[224]	Not applicable (quasi)	Not applicable (quasi)	Not applicable (quasi)	Not applicable (quasi)	Low risk	Unclear	High risk
Arias-Buría *et al.* 2015[230]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Arias-Buría *et al.* 2017[229]	Low risk	Low risk	Unclear	Low risk	Unclear	Low risk	High risk
Bahr *et al.* 2006[131]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Balius *et al.* 2016[238]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Beyer *et al.* 2015[18]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Blume *et al.* 2015[699]	Unclear	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Boudreau *et al.* 2019[262]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Breda *et al.* 2020[696]	Low risk	Low risk	High risk	Low risk	Low risk	High risk	High risk

continued

TABLE 45 Effectiveness review 1C: Risk of bias results for the 93 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Chaconas *et al.* 2017[710]	Low risk	Unclear	Unclear	Low risk	High risk	Unclear	High risk
Cheng *et al.* 2007[286]	High risk	High risk	Unclear	Unclear	Unclear	Unclear	High risk
Cho *et al.* 2017[289]	High risk	High risk	Unclear	Unclear	Low risk	Low risk	Unclear
de Vos *et al.* 2007[59]	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk	High risk
Dejaco *et al.* 2017[44]	Low risk	Low risk	Low risk	Low risk	Low risk	High risk	Low risk
Dimitrios *et al.* 2012[330]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dimitrios *et al.* 2013[692]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dupuis *et al.*[339]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Ganderton *et al.* 2018[189]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Gatz *et al.* 2020[365]	Low risk	Low risk	Low risk	Low risk	Unclear	Unclear	High risk
Giray *et al.* 2019[368]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Hallgren *et al.* 2014[383]	High risk	Low risk	High risk	Low risk	Unclear	Low risk	Low risk
Heron *et al.* 2017[390]	Low risk	Low risk	Low risk	Low risk	High risk	High risk	Low risk
Hotta *et al.* 2020[709]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Johansson *et al.* 2005[405]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	High risk
Jonsson 2009[408]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
Ketola *et al.* 2009[426]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	High risk
Knobloch *et al.* 2007[684]	Low risk	Low risk	Unclear	Unclear	High risk	Unclear	High risk
Knobloch *et al.* 2007[192]	Unclear	Unclear	High risk	Low risk	Unclear	Unclear	High risk
Knobloch *et al.* 2008[437]	Unclear	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Kongsgaard *et al.*[21]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk

TABLE 45 Effectiveness review 1C: Risk of bias results for the 93 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Kromer *et al.* 2014[445]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Kromer *et al.* 2013[443]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Littlewood *et al.* 2016[34]	Low risk	Low risk	High risk	High risk	Unclear	Unclear	High risk
Luginbuhl *et al.* 2008[174]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Maenhout *et al.* 2013[464]	Unclear	High risk	High risk	High risk	Low risk	Unclear	Low risk
Mafi *et al.* 2001[467]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Manias *et al.* 2006[469]	High risk	High risk	High risk	High risk	Low risk	Unclear	Unclear
Martinez-Silvestrini *et al.* 2005[471]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	High risk
Marzetti *et al.* 2014[472]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
McCormack *et al.* 2016[478]	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk	Low risk
Mulligan *et al.* 2016[489]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	High risk
Nørregaard *et al.* 2007[499]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Nowotny *et al.* 2018[501]	Low risk	Unclear	Low risk	Low risk	High risk	Unclear	High risk
Østerås *et al.* 2009[512]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	High risk
Park *et al.* 2010[521]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Pearson *et al.* 2012[525]	Unclear	Unclear	High risk	Unclear	Low risk	Unclear	High risk
Pearson *et al.* 2018[526]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Pekyavas *et al.* 2016[527]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Low risk
Petersen *et al.* 2007[530]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Peterson *et al.* 2011[531]	Low risk	Low risk	Unclear	High risk	Low risk	Low risk	Low risk
Peterson *et al.* 2014[185]	Low risk	Unclear	Low risk	High risk	Low risk	Low risk	Low risk

continued

TABLE 45 Effectiveness review 1C: Risk of bias results for the 93 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Praet *et al.* 2019[535]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Rabusin *et al.* 2020[686]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	High risk
Rio *et al.* 2017[167]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Romero-Morales *et al.* 2020[685]	Unclear	Unclear	Unclear	Unclear	Low risk	Low risk	High risk
Rompe *et al.* 2007[558]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Rompe *et al.* 2008[687]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Unclear
Rompe *et al.* 2009[557]	Unclear	Low risk	High risk	High risk	Low risk	Unclear	Low risk
Rompe *et al.* 2009[559]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Roos *et al.* 2004[193]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	Low risk
Şenbursa *et al.* 2011[582]	Low risk	Unclear	Unclear	Unclear	Low risk	Unclear	Low risk
Sevier *et al.* 2015[584]	Low risk	Unclear	High risk	High risk	High risk	Unclear	High risk
Silbernagel *et al.* 2001[587]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Silbernagel *et al.* 2007[138]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	Low risk
Slider *et al.* 2013[690]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	Unclear
Stasinopoulos and Manias 2013[692]	High risk	High risk	High risk	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2006[599]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2010[601]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2017[597]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	High risk
Stefansson *et al.* 2019[184]	Low risk	Unclear	High risk	Low risk	High risk	Unclear	Low risk
Steunebrink *et al.* 2013[605]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk

TABLE 45 Effectiveness review 1C: Risk of bias results for the 93 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Stevens *et al.* 2014[175]	Unclear	Unclear	High risk	High risk	Unclear	Unclear	High risk
Svernlov and Adolfsson 2001[614]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Unclear	Unclear	Unclear	High risk
Tonks *et al.* 2007[624]	Low risk	Low risk	Low risk	High risk	High risk	Low risk	Low risk
Turgut *et al.* 2017[633]	Low risk	Unclear	Unclear	Unclear	High risk	Unclear	Low risk
Vallés-Carrascosa *et al.* 2018[638]	Low risk	Low risk	Low risk	High risk	Low risk	Low risk	High risk
van Ark *et al.* 2016[644]	Low risk	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk
Vinuesa-Montoya *et al.* 2017[641]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
Visnes *et al.* 2005[129]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Unclear
Vuvan *et al.* 2019[187]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Walther *et al.* 2004[161]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear
Wegener *et al.* 2016[655]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	High risk
Wen *et al.* 2011[657]	Unclear	Unclear	Low risk	Unclear	High risk	Unclear	High risk
Werner *et al.* 2002[658]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Wiedmann *et al.* 2017[664]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Yelland *et al.* 2011[674]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Young *et al.* 2005[132]	Unclear	Unclear	High risk	Low risk	High risk	Unclear	High risk
Yu *et al.* 2013[680]	Low risk	Low risk	Low risk	Unclear	Low risk	Unclear	Unclear

TABLE 46 Effectiveness review 1C: Moderator analysis: resistance exercise intensity: checklist of tendinopathy locations and outcome domains included in resistance exercise intensity moderator analyses

Moderator	Model	Tendinopathy number TAs	Tendinopathy number outcomes	Outcome domain number TAs	Outcome domain number outcomes
Intensity: body mass	Large effects/ upper body	RCSP: 7 Elbow: 4	RCSP: 60 Elbow: 8	Disability: 8 Pain: 7 Function: 2	Disability: 35 Pain: 29 Function: 4
Intensity: additional	Large effects/ upper body	RCSP: 27 Elbow: 19	RCSP: 184 Elbow: 115	Disability: 38 Pain: 32 Function: 18	Disability: 121 Pain: 134 Function: 44
Intensity: body mass	Large effects/ lower body	Achilles: 20 Patellar: 3 Gluteal: 1	Achilles: 112 Patellar: 10 Gluteal: 3	Disability: 18 Pain: 19 Function: 4	Disability:56 Pain: 61 Function: 8
Intensity: additional	Large effects/ lower body	Achilles: 17 Patellar: 16 Gluteal: 1	Achilles: 63 Patellar: 56 Gluteal: 14	Disability: 30 Pain: 22 Function: 3	Disability: 77 Pain: 47 Function: 9
Intensity: body mass	Small effects/ upper body	RCSP: 4 Elbow: 1	RCSP: 14 Elbow: 1	QoL: 0 PFC: 3 ROM: 4	QoL: 0 PFC: 7 ROM: 8
Intensity: additional	Small effects/ upper body	RCSP: 15 Elbow: 12	RCSP: 151 Elbow: 54	QoL: 5 PFC: 21 ROM: 10	QoL: 31 PFC: 105 ROM: 69
Intensity: body mass	Small effects/ lower body	Achilles: 6 Patellar: 1 Gluteal: 1	Achilles: 71 Patellar: 6 Gluteal: 6	QoL: 2 PFC: 6	QoL: 5 PFC: 78
Intensity: additional	Small effects/ lower body	Achilles: 5 Patellar: 2 Gluteal: 2	Achilles: 43 Patellar: 10 Gluteal: 8	QoL: 2 PFC: 8	QoL: 10 PFC: 51

TABLE 47 Strength of evidence assessment for moderator levels in meta-regression investigating resistance exercise intensity.

Moderator	Model	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Intensity: body mass	All tendi-nopathies/ large-effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Intensity: additional	All tendi-nopathies/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Intensity: body mass	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Intensity: additional	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Intensity: body mass	Lower body/ large effects	Low risk	Low risk	Low risk	Low risk	Low risk	High
Intensity: additional	Lower body/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Intensity: body mass	All tendi-nopathies/ small effects	Low risk	Low risk	Low risk	Low risk	Low risk	High

TABLE 47 Strength of evidence assessment for moderator levels in meta-regression investigating resistance exercise intensity (*continued*)

Moderator	Model	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Intensity: additional	All tendi-nopathies/ small effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Intensity: body mass	Upper body/ Small effects	Low risk	Low risk	High risk	Low risk	Low risk	Moderate
Intensity: additional	Upper body/ small effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Intensity: additional	Lower body/ small effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Intensity: body mass	Lower body/ small effects	Low risk	Low risk	High risk	Low risk	Low risk	Moderate

TABLE 48 Resistance exercise volume (number of repetitions): Checklist of tendinopathy locations and outcome domains included in resistance exercise volume moderator analyses

Moderator	Model	Tendinopathy number treatment arms	Tendinopathy number outcomes	Outcome domain number treatment arms	Outcome domain number outcomes
Volume: low volume	Large effects/ upper body	RCSP: 26 Elbow: 14	RCSP: 164 Elbow: 53	Disability: 32 Pain: 27 Function: 13	Disability: 95 Pain: 96 Function: 26
Volume: high volume	Large effects/ upper body	RCSP: 9 Elbow: 7	RCSP: 75 Elbow: 71	Disability: 13 Pain: 13 Function: 6	Disability: 53 Pain: 72 Function: 21
Volume: low volume	Large effects/ lower body	Achilles: 3 Patellar: 7 Gluteal: 1	Achilles: 29 Patellar: 22 Gluteal: 3	Disability: 8 Pain: 8 Function: 1	Disability: 30 Pain: 23 Function: 1
Volume: high volume	Large effects/ lower body	Achilles: 33 Patellar: 10 Gluteal: 0	Achilles: 133 Patellar: 43 Gluteal: 0	Disability: 36 Pain: 31 Function: 5	Disability: 87 Pain: 77 Function: 12
Volume: low volume	Small effects/ upper body	RCSP: 14 Elbow: 7	RCSP: 136 Elbow: 12	QoL: 0 PFC: 17 ROM: 12	QoL: 0 PFC: 80 ROM: 68
Volume: high volume	Small effects/ upper body	RCSP: 3 Elbow: 5	RCSP: 20 Elbow: 39	QoL: 5 PFC: 6 ROM: 0	QoL: 31 PFC: 28 ROM: 0
Volume: low volume	Small effects/ lower body	Achilles: 1 Patellar: 0 Gluteal: 2	Achilles: 9 Patellar: 0 Gluteal: 12	QoL: 0 PFC: 3	QoL: 0 PFC: 21
Volume: high volume	Small effects/ lower body	Achilles: 11 Patellar: 2 Gluteal: 0	Achilles: 106 Patellar: 8 Gluteal: 0	QoL: 4 PFC: 10	QoL: 12 PFC: 102

TABLE 49 Strength of evidence assessment for moderator levels in meta-regression investigating resistance exercise intensity

Moderator	Model	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Volume: low volume	All tendinopathies/large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Volume: high volume	All tendinopathies/large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Volume: low volume	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Volume: high volume	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Volume: low volume	Lower body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Volume: high volume	Lower body/ large effects	Low risk	Low risk	Low risk	Low risk	Low risk	High
Volume: low volume	All tendinopathies/Smmall effects	Low risk	Low risk	Low risk	Low risk	Low risk	High
Volume: high volume	All tendinopathies/small effects	Low risk	High risk	Low risk	Low risk	High risk	Low
Volume: low volume	Upper body/ small effects	Low risk	Low risk	Low risk	Low risk	Low risk	High
Volume: high volume	Upper body/ small effects	Low risk	High risk	High risk	Low risk	High risk	Low
Volume: low volume	Lower body/ small effects	Low risk	High risk	High risk	Low risk	Low risk	Low
Volume: high volume	Lower-body/ small effects	Low risk	Low risk	High risk	Low risk	High risk	Low

TABLE 50 Resistance exercise volume (number of exercises): Checklist of tendinopathy locations and outcome domains included in resistance exercise volume moderator analyses

Moderator	Model	Tendinopathy number TAs	Tendinopathy number outcomes	Outcome domain number TAs	Outcome domain number outcomes
Volume: low volume	Large effects/ upper body	RCSP: 5 Elbow: 18	RCSP: 37 Elbow: 89	Disability: 14 Pain: 16 Function: 11	Disability: 43 Pain: 61 Function: 22
Volume: high volume	Large effects/ upper body	RCSP: 30 Elbow: 5	RCSP: 207 Elbow: 36	Disability: 33 Pain: 25 Function: 8	Disability: 110 Pain: 109 Function: 24
Volume: low volume	Large effects/ lower body	Achilles: 33 Patellar: 17 Gluteal: 0	Achilles: 143 Patellar: 63 Gluteal: 0	Disability: 42 Pain: 34 Function: 6	Disability: 108 Pain: 85 Function: 13
Volume: high volume	Large effects/ lower body	Achilles: 4 Patellar: 2 Gluteal: 2	Achilles: 23 Patellar: 10 Gluteal: 17	Disability: 6 Pain: 7 Function: 1	Disability: 24 Pain: 22 Function: 4

TABLE 50 Resistance exercise volume (number of exercises): Checklist of tendinopathy locations and outcome domains included in resistance exercise volume moderator analyses (*continued*)

Moderator	Model	Tendinopathy number TAs	Tendinopathy number outcomes	Outcome domain number TAs	Outcome domain number outcomes
Volume: low volume	Small effects/ upper body	RCSP: 4 Elbow: 9	RCSP: 43 Elbow: 45	QoL: 3 PFC: 13 ROM: 3	QoL: 21 PFC: 48 ROM: 19
Volume: high volume	Small effects/ upper body	RCSP: 14 Elbow: 3	RCSP: 116 Elbow: 8	QoL: 2 PFC: 10 ROM: 10	QoL: 10 PFC: 62 ROM: 52
Volume: low volume	Small effects/ lower body	Achilles: 9 Patellar: 2 Gluteal: 1	Achilles: 58 Patellar: 8 Gluteal: 6	QoL: 9 PFC: 4	QoL: 12 PFC: 60
Volume: high volume	Small effects/ lower body	Achilles: 3 Patellar: 1 Gluteal: 2	Achilles: 57 Patellar: 6 Gluteal: 10	QoL: 1 PFC: 5	QoL: 4 PFC: 69

TABLE 51 Strength of evidence assessment for moderator levels in meta-regression investigating resistance exercise intensity

Moderator	Model	Overall RoB	Inconsistency	Imprecision	Indirectness	Small study-effects	Strength of evidence
Volume: low volume	All tendi-nopathies/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Volume: high volume	All tendi-nopathies/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Volume: low volume	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Volume: high volume	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Volume: low volume	Lower body/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Volume: high volume	Lower body/ large effects	Low risk	Low risk	High risk	Low risk	Low risk	Moderate
Volume: low volume	All tendi-nopathies/ small effects	Low risk	High risk	Low risk	Low risk	High risk	Low
Volume: high volume	All tendi-nopathies/ small effects	Low risk	Low risk	Low risk	Low risk	Low risk	High
Volume: low volume	Upper body/ small effects	Low risk	High risk	Low risk	Low risk	High risk	Low
Volume: high volume	Upper body/ small effects	Low risk	Low risk	Low risk	Low risk	Low risk	High
Volume: low volume	Lower body/ small effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Volume: high volume	Lower body/ small effects	Low risk	High risk	High risk	Low risk	Low risk	Low

continued

TABLE 52 Resistance exercise frequency: Checklist of tendinopathy locations and outcome domains included in resistance exercise frequency moderator analyses

Moderator	Model	Tendinopathy number TAs	Tendinopathy number outcomes	Outcome domain number TAs	Outcome domain number outcomes
Frequency: low (less than once per day)	Large effects/ upper body	RCSP: 14 Elbow: 11	RCSP: 105 Elbow: 51	Disability: 15 Pain: 18 Function: 12	Disability: 57 Pain: 64 Function: 35
Frequency: mid (once per day)	Large effects/ upper body	RCSP: 11 Elbow: 8	RCSP: 72 Elbow: 55	Disability: 19 Pain: 15 Function: 4	Disability: 67 Pain: 56 Function: 4
Frequency: high (more than once per day)	Large effects/ upper body	RCSP: 10 Elbow: 2	RCSP: 64 Elbow: 8	Disability: 12 Pain: 6 Function: 1	Disability: 39 Pain: 30 Function: 3
Frequency: low (less than once per day)	Large effects/ lower body	Achilles: 3 Patellar: 9 Gluteal: 0	Achilles: 8 Patellar: 30 Gluteal: 0	Disability: 8 Pain: 11 Function: 0	Disability: 12 Pain: 26 Function: 0
Frequency: mid (once per day)	Large effects/ lower body	Achilles: 9 Patellar: 1 Gluteal: 0	Achilles: 31 Patellar: 2 Gluteal: 0	Disability: 9 Pain: 5 Function: 1	Disability: 18 Pain: 14 Function: 1
Frequency: high (more than once per day)	Large effects/ lower body	Achilles: 25 Patellar: 9 Gluteal: 2	Achilles: 129 Patellar: 41 Gluteal: 17	Disability: 31 Pain: 26 Function: 6	Disability: 102 Pain: 69 Function: 16
Frequency: low (less than once per day)	Small effects/ upper body	RCSP: 9 Elbow: 1	RCSP: 87 Elbow: 3	QoL: 0 PFC: 6 ROM: 8	QoL: 0 PFC: 44 ROM: 46
Frequency: mid (once per day)	Small effects/ upper body	RCSP: 8 Elbow: 5	RCSP: 46 Elbow: 41	QoL: 3 PFC: 12 ROM: 4	QoL: 21 PFC: 45 ROM: 21
Frequency: high (more than once per day)	Small effects/ upper body	RCSP: 5 Elbow: 2	RCSP: 32 Elbow: 5	QoL: 2 PFC: 4 ROM: 2	QoL: 10 PFC: 17 ROM: 10
Frequency: low (less than once per day)	Small effects/ lower body	Achilles: 2 Patellar: 1 Gluteal: 2	Achilles: 26 Patellar: 6 Gluteal: 12	QoL: 0 PFC: 5	QoL: 0 PFC: 44
Frequency: mid (once per day)	Small effects/ lower body	Achilles: 4 Patellar: 0 Gluteal: 0	Achilles: 50 Patellar: 0 Gluteal: 0	QoL: 2 PFC: 2	QoL: 2 PFC: 48
Frequency: high (more than once per day)	Small effects/ lower body	Achilles: 6 Patellar: 2 Gluteal: 1	Achilles: 39 Patellar: 8 Gluteal: 4	QoL: 3 PFC: 7	QoL: 14 PFC: 37

TABLE 53 Strength of evidence assessment for moderator levels in meta-regression investigating resistance exercise intensity

Moderator	Model	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Frequency: low (less than once per day)	All tendi-nopathies/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Frequency: mid (once per day)	All tendi-nopathies/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Frequency: high (more than once per day)	All tendi-nopathies/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Frequency: low (less than once per day)	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Frequency: mid (once per day)	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Frequency: high (more than once per day)	Upper body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Frequency: low (less than once per day)	Lower body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Frequency: mid (once per day)	Lower body/ large effects	Low risk	Low risk	High risk	Low risk	High risk	Low
Frequency: high (more than once per day)	Lower body/ large effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Frequency: low (less than once per day)	All tendi-nopathies/ small effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Frequency: mid (once per day)	All tendi-nopathies/ small effects	Low risk	High risk	Low risk	Low risk	High risk	Low
Frequency: high (more than once per day)	All tendi-nopathies/ small effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Frequency: low (less than once per day)	Upper body/ small effects	Low risk	Low risk	Low risk	Low risk	High risk	Moderate
Frequency: mid (once per day)	Upper body/ small effects	Low risk	High risk	Low risk	Low risk	High risk	Low
Frequency: high (more than once per day)	Upper body/ small -effects	Low risk	Low risk	Low risk	Low risk	Low risk	High
Frequency: low (less than once per day)	Lower body/ small effects	Low risk	High risk	High risk	Low risk	High risk	Very low
Frequency: mid (once per day)	Lower body/ small effects	Low risk	High risk	High risk	Low risk	Low risk	Low
Frequency: high (more than once per day)	Lower body/ small effects	High risk	Low risk	High risk	Low risk	High risk	Very low

Effectiveness review 2

TABLE 54 Effectiveness review 2: Risk of bias results for the 37 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Balius *et al.* 2016[238]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Başkurt *et al.* 2011[246]	Low risk	Unclear	High risk	Unclear	Low risk	Unclear	Low risk
Beyer *et al.* 2015[18]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Blume *et al.* 2015[699]	Unclear	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Breda *et al.* 2020[696]	Low risk	Low risk	High risk	Low risk	Low risk	High risk	High risk
Chaconas *et al.* 2017[710]	Low risk	Unclear	Unclear	Low risk	High risk	Unclear	High risk
Dejaco *et al.* 2017[44]	Low risk	Low risk	Low risk	Low risk	Low risk	High risk	Low risk
Dimitrios *et al.* 2012[330]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dimitrios *et al.* 2013[692]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dupuis *et al.*[339]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Gatz *et al.* 2020[365]	Low risk	Low risk	Low risk	Low risk	Unclear	Unclear	High risk
Hallgren *et al.* 2014[383]	High risk	Low risk	High risk	Low risk	Unclear	Low risk	Low risk
Heron *et al.* 2017[390]	Low risk	Low risk	Low risk	Low risk	High risk	High risk	Low risk
Hotta *et al.* 2020[709]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Jonsson 2009[408]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
Juul-Kristensen *et al.* 2019[412]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Kongsgaard *et al.*[21]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk

TABLE 54 Effectiveness review 2: Risk of bias results for the 37 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Maenhout *et al.* 2013[464]	Unclear	High risk	High risk	High risk	Low risk	Unclear	Low risk
Mafi *et al.* 2001[467]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Martinez-Silvestrini *et al.* 2005[471]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	High risk
Marzetti *et al.* 2014[472]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Nørregaard *et al.* 2007[499]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Peterson *et al* 2014[185]	Low risk	Unclear	Low risk	High risk	Low risk	Low risk	Low risk
Rio *et al.* 2017[167]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Romero-Morales *et al.* 2020[685]	Unclear	Unclear	Unclear	Unclear	Low risk	Low risk	High risk
Silbernagel *et al.* 2001[587]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Slider *et al.* 2013[690]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	Unclear
Stasinopoulos *et al.* 2017[597]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	High risk
Steunebrink *et al.* 2013[605]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Turgut *et al.* 2017[633]	Low risk	Unclear	Unclear	Unclear	High risk	Unclear	Low risk
van Ark *et al.* 2016[644]	Low risk	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk
Walther *et al.* 2004[161]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear
Werner *et al.* 2002[658]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Young *et al.* 2005[132]	Unclear	Unclear	High risk	Low risk	High risk	Unclear	High risk
Yu *et al.* 2013[680]	Low risk	Low risk	Low risk	Unclear	Low risk	Unclear	Unclear

TABLE 55 Dominant exercise class comparison: Checklist of pairwise comparisons of dominant exercise therapy classes with resistance exercise as the reference class. Table provides numbers of studies, numbers of comparisons and outcomes across tendinopathy locations and outcome domains

Tendinopathy location	Outcome domain	Resistance vs. flexibility	Resistance vs. proprioception
All	All	9 studies, 18 comparisons, 152 outcomes	4 studies, 4 comparisons, 68 outcomes
All	Disability	9 studies, 18 comparisons, 56 outcomes	4 studies, 4 comparisons, 18 outcomes
All	Pain	5 studies, 13 comparisons, 55 outcomes	3 studies, 3 comparisons, 15 outcomes
All	Function	1 study, 2 comparisons, 2 outcomes	No data
All	PFC	3 studies, 4 comparisons, 13 outcomes	2 studies, 2 comparisons, 23 outcomes
All	QoL	2 studies, 2 comparisons, 10 outcomes	No data
RCSP	All	5 studies, 6 comparisons, 79 outcomes	4 studies, 4 comparisons, 68 outcomes
RCSP	Disability	5 studies, 6 comparisons, 21 outcomes	4 studies, 4 comparisons, 18 outcomes
RCSP	Pain	3 studies, 3 comparisons, 21 outcomes	3 studies, 3 comparisons, 15 outcomes
RCSP	Function	No data	No data
RCSP	PFC	2 studies, 2 comparisons, 11 outcomes	2 studies, 2 comparisons, 23 outcomes
RCSP	QoL	2 studies, 2 comparisons, 9 outcomes	No data
RCSP	ROM	2 studies, 2 comparisons, 16 outcomes	1 study, 1 comparison, 12 outcomes
Achilles	All	2 studies, 9 comparisons, 63 outcomes	No data
Achilles	Disability	2 studies, 9 comparisons, 31 outcomes	No data
Achilles	Pain	1 study, 8 comparisons, 32 outcomes	No data
Achilles	Function	No data	No data
Achilles	PFC	No data	No data
Achilles	QoL	No data	No data
Elbow	All	1 study, 2 comparisons, 8 outcomes	No data
Elbow	Disability	1 study, 2 comparisons, 2 outcomes	No data
Elbow	Pain	1 study, 2 comparisons, 2 outcomes	No data
Elbow	Function	1 study, 2 comparisons, 2 outcomes	No data
Elbow	PFC	1 study, 2 comparisons, 2 outcomes	No data
Elbow	QoL	No data	No data
Patellar	All	1 study, 1 comparison, 2 outcomes	No data
Patellar	Disability	1 study, 2 comparisons, 2 outcomes	No data
Patellar	Pain	No data	No data
Patellar	Function	No data	No data

TABLE 55 Dominant exercise class comparison: Checklist of pairwise comparisons of dominant exercise therapy classes with resistance exercise as the reference class. Table provides numbers of studies, numbers of comparisons and outcomes across tendinopathy locations and outcome domains (*continued*)

Tendinopathy location	Outcome domain	Resistance vs. flexibility	Resistance vs. proprioception
Patellar	PFC	No data	No data
Patellar	QoL	No data	No data
Gluteal	All	No data	No data
Gluteal	Disability	No data	No data
Gluteal	Pain	No data	No data
Gluteal	Function	No data	No data
Gluteal	PFC	No data	No data
Gluteal	QoL	No data	No data

TABLE 56 Strength of evidence assessment for pairwise comparisons of dominant exercise therapy classes with resistance exercise as the reference class

Comparison	Outcome	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Resistance vs. flexibility	All tendinopathies/all outcomes	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
Resistance vs. flexibility	All tendinopathies/disability	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance vs. flexibility	All tendinopathies/pain	Low risk	Low risk	Low risk	Low risk	Low risk	High
Resistance vs. flexibility	All tendinopathies/PFC	Unclear	High risk	High risk	Low risk	High risk	Very low
Resistance vs. flexibility	All tendinopathies/QoL	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance vs. flexibility	RCSP/All outcomes	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance vs. flexibility	RCSP/disability	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance vs. flexibility	RCSP/pain	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance vs. flexibility	RCSP/PFC	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance vs. flexibility	RCSP/ROM	Unclear	High risk	High risk	Low risk	Low risk	Very low
Resistance vs. flexibility	Achilles/all outcomes	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
Resistance vs. flexibility	Achilles/disability	Low risk	High risk	High risk	Low risk	Low risk	Low

TABLE 56 Strength of evidence assessment for pairwise comparisons of dominant exercise therapy classes with resistance exercise as the reference class (*continued*)

Comparison	Outcome	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Resistance vs. proprio-ception	All tendi-nopathies/all outcomes	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance vs. proprio-ception	All tendi-nopathies/disability	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance vs. proprio-ception	All tendi-nopathies/pain	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance vs. proprio-ception	All tendi-nopathies/PFC	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance vs. proprio-ception	RCSP/all outcomes	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance vs. flexibility	RCSP/disability	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance vs. flexibility	RCSP/pain	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance vs. flexibility	RCSP/PFC	Low risk	High risk	High risk	Low risk	Low risk	Low

TABLE 57 Complete exercise class comparison: Checklist of pairwise comparisons of complete exercise therapy classes with resistance-only exercise as the reference class. Table provides numbers of studies, numbers of comparisons and outcomes across tendinopathies and outcome domains

Tendinopathy	Outcome domain	Resistance-only vs. flexibility-only	Resistance-only vs. resistance + flexibility
All	All	3 studies, 10 comparisons, 77 outcomes	3 studies, 4 comparisons, 26 outcomes
All	Disability	3 studies, 10 comparisons, 35 outcomes	1 study, 1 comparison, 2 outcomes
All	Pain	2 studies, 9 comparisons, 38 outcomes	2 studies, 3 comparisons, 5 outcomes
All	Function	No data	1 study, 2 comparisons, 4 outcomes
All	PFC	No data	2 studies, 2 comparisons, 15 outcomes
All	QoL	1 study, 1 comparison, 4 outcomes	No data
RCSP	All	1 study, 1 comparison, 14 outcomes	No data
RCSP	Disability	1 study, 1 comparison, 4 outcomes	No data
RCSP	Pain	1 study, 1 comparison, 6 outcomes	No data

TABLE 57 Complete exercise class comparison: Checklist of pairwise comparisons of complete exercise therapy classes with resistance-only exercise as the reference class. Table provides numbers of studies, numbers of comparisons and outcomes across tendinopathies and outcome domains (*continued*)

Tendinopathy	Outcome domain	Resistance-only vs. flexibility-only	Resistance-only vs. resistance + flexibility
RCSP	Function	No data	No data
RCSP	PFC	No data	No data
RCSP	QoL	1 study, 1 comparison, 4 outcomes	No data
RCSP	ROM	No data	No data
Achilles	All	2 studies, 9 comparisons, 63 outcomes	1 study, 1 comparison, 14 outcomes
Achilles	Disability	2 studies, 9 comparisons, 31 outcomes	No data
Achilles	Pain	1 study, 8 comparisons, 32 outcomes	1 study, 1 comparison, 1 outcome
Achilles	Function	No data	No data
Achilles	PFC	No data	1 study, 1 comparison, 13 outcomes
Achilles	QoL	No data	No data
Elbow	All	No data	1 study, 2 comparisons, 10 outcomes
Elbow	Disability	No data	No data
Elbow	Pain	No data	1 study, 2 comparisons, 4 outcomes
Elbow	Function	No data	1 study, 2 comparisons, 4 outcomes
Elbow	PFC	No data	1 study, 2 comparisons, 2 outcomes
Elbow	QoL	No data	No data
Patellar	All	No data	1 study, 1 comparison, 2 outcomes
Patellar	Disability	No data	1 study, 1 comparison, 2 outcomes
Patellar	Pain	No data	No data
Patellar	Function	No data	No data
Patellar	PFC	No data	No data
Patellar	QoL	No data	No data
Gluteal	All	No data	No data
Gluteal	Disability	No data	No data
Gluteal	Pain	No data	No data
Gluteal	Function	No data	No data
Gluteal	PFC	No data	No data
Gluteal	QoL	No data	No data

TABLE 58 Strength of evidence assessment for pairwise comparisons of complete exercise therapy classes with resistance-only exercise as the reference class

Comparison	Outcome	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Resistance-only vs. flexibility-only	All tendinopathies/ all outcomes	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
Resistance-only vs. flexibility-only	All tendinopathies/ disability	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance-only vs. flexibility-only	All tendinopathies/ pain	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
Resistance-only vs. flexibility-only	Achilles/all outcomes	Low risk	High risk	Low risk	Low risk	Low risk	Moderate
Resistance-only vs. flexibility-only	Achilles/ disability	Low risk	High risk	High risk	Low risk	Low risk	Low
Resistance-only vs. resistance + flexibility	All tendinopathies/ all outcomes	Low risk	High risk	High risk	Low risk	High risk	Very low
Resistance-only vs. resistance + Flexibility	All tendinopathies/ PFC	Low risk	High risk	High risk	Low risk	High risk	Very low

TABLE 59 Dominant exercise treatment comparison: Checklist of pairwise comparisons of dominant resistance exercise therapy treatments with eccentric-only exercise as the reference class. Table provides numbers of studies, numbers of comparisons and outcomes across tendinopathies and outcome domains

Tendinopathy	Outcome domain	Eccentric-only vs concentric and eccentric	Eccentric-only vs concentric-only	Eccentric only vs isometric
All	All	6 studies, 7 comparisons, 56 outcomes	7 studies, 7 comparisons, 57 outcomes	4 studies, 4 comparisons, 16 outcomes
All	Disability	5 studies, 5 comparisons, 14 outcomes	5 studies, 5 comparisons, 8 outcomes	2 studies, 2 comparisons, 7 outcomes
All	Pain	5 studies, 6 comparisons, 18 outcomes	6 studies, 6 comparisons, 15 outcomes	2 studies, 2 comparisons, 4 outcomes
All	Function	1 study, 2 comparisons, 4 outcomes	1 study, 1 comparison, 1 outcome	3 studies, 3 comparisons, 5 outcomes
All	PFC	3 studies, 4 comparisons, 17 outcomes	4 studies, 4 comparisons, 23 outcomes	No data
All	QoL	No data	1 study, 1 comparison, 9 outcomes	No data
RCSP	All	2 studies, 2 comparisons, 30 outcomes	1 study, 1 comparison, 7 outcomes	No data
RCSP	Disability	2 studies, 2 comparisons, 8 outcomes	1 study, 1 comparison, 2 outcomes	No data
RCSP	Pain	1 study, 1 comparison, 6 outcomes	No data	No data
RCSP	Function	No data	No data	No data
RCSP	PFC	2 studies, 2 comparisons, 13 outcomes	1 study, 1 comparison, 4 outcomes	No data

TABLE 59 Dominant exercise treatment comparison: Checklist of pairwise comparisons of dominant resistance exercise therapy treatments with eccentric-only exercise as the reference class. Table provides numbers of studies, numbers of comparisons and outcomes across tendinopathies and outcome domains (*continued*)

Tendinopathy	Outcome domain	Eccentric-only vs concentric and eccentric	Eccentric-only vs concentric-only	Eccentric only vs isometric
RCSP	QoL	No data	No data	No data
RCSP	ROM	1 study, 1 comparison, 3 outcomes	1 study, 1 comparison, 1 outcome	No data
Achilles	All	1 study, 1 comparison, 6 outcomes	3 studies, 3 comparisons, 17 outcomes	1 study, 1 comparison, 6 outcomes
Achilles	Disability	1 study, 1 comparison, 4 outcomes	1 study, 1 comparison, 1 outcome	1 study, 1 comparison, 5 outcomes
Achilles	Pain	1 study, 1 comparison, 2 outcomes	3 studies, 3 comparisons, 3 outcomes	No data
Achilles	Function	No data	No data	1 study, 1 comparison, 1 outcome2
Achilles	PFC	No data	1 study, 1 comparison, 13 outcomes	No data
Achilles	QoL	No data	No data	No data
Elbow	All	1 study, 2 comparisons, 12 outcomes	2 studies, 2 comparisons, 31 outcomes	2 studies, 2 comparisons, 8 outcomes
Elbow	Disability	No data	2 studies, 2 comparisons, 4 outcomes	No data
Elbow	Pain	1 study, 2 comparisons, 4 outcomes	2 studies, 2 comparisons, 11 outcomes	2 studies, 2 comparisons, 4 outcomes
Elbow	Function	1 study, 2 comparisons, 4 outcomes	1 study, 1 comparison, 1 outcome	2 studies, 2 comparisons, 4 outcomes
Elbow	PFC	1 study, 2 comparisons, 4 outcomes	2 studies, 2 comparisons, 6 outcomes	No data
Elbow	QoL	No data	1 study, 1 comparison, 9 outcomes	No data
Patellar	All	2 studies, 2 comparisons, 8 outcomes	1 study, 1 comparison, 2 outcomes	1 study, 1 comparison, 2 outcomes
Patellar	Disability	2 studies, 2 comparisons, 4 outcomes	1 study, 1 comparison, 1 outcome	1 study, 1 comparison, 2 outcomes
Patellar	Pain	2 studies, 2 comparisons, 4 outcomes	1 study, 1 comparison, 1 outcome	No data
Patellar	Function	No data	No data	No data
Patellar	PFC	No data	No data	No data
Patellar	QoL	No data	No data	No data
Gluteal	All	No data	No data	No data
Gluteal	Disability	No data	No data	No data
Gluteal	Pain	No data	No data	No data
Gluteal	Function	No data	No data	No data
Gluteal	PFC	No data	No data	No data
Gluteal	QoL	No data	No data	No data

TABLE 60 Strength of evidence assessment for pairwise comparisons of dominant resistance exercise therapy treatments with eccentric-only exercise as the reference class

Comparison	Outcome	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Eccentric-only vs. concentric-only	All tendinopathies/ all outcomes	Low risk	High risk	High risk	Low risk	High risk	Very low
Eccentric-only vs. concentric-only	All tendinopathies/ pain	Low risk	High risk	High risk	Low risk	High risk	Very low
Eccentric-only vs. concentric-only	All tendinopathies/ PFC	Low risk	High risk	High risk	Low risk	High risk	Very low
Eccentric-only vs. concentric-only	Achilles/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. concentric-only	Elbow/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. concentric-only	Elbow/pain	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. concentric and eccentric	All tendinopathies/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. concentric and eccentric	All tendinopathies/ disability	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. concentric and eccentric	All tendinopathies/ pain	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. concentric and eccentric	All tendinopathies/ PFC	Low risk	High risk	High risk	Low risk	High risk	Very low
Eccentric-only vs. concentric and eccentric	RCSP/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. concentric and eccentric	RCSP/PFC	Low risk	High risk	High risk	Low risk	Low risk	Low
Eccentric-only vs. isometric	All tendinopathies/ all outcomes	Low risk	High risk	High risk	Low risk	High risk	Very low

Effectiveness review 3

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Abat *et al.* 2016[213]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Unclear	Low risk	Unclear	High risk
Aceituno-Gómez *et al.* 2019[215]	Low risk	Unclear	Low risk	Low risk	Low risk	Low risk	High risk
Akkaya *et al.* 2016[218]	Low risk	Unclear	High risk	High risk	Low risk	Unclear	Low risk
Aktas *et al.* 2007[220]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	Low risk
Akyol *et al.* 2012[221]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	High risk
Alfredson *et al.* 1998[17]	High risk	Unclear	High risk	Unclear	Low risk	Unclear	High risk
Alfredson *et al.* 1999[224]	Not applicable (quasi)	Not applicable (quasi)	High risk	High risk	Low risk	Unclear	High risk
Arias-Buría *et al.* 2015[230]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Arias-Buría *et al.* 2017[229]	Low risk	Low risk	Unclear	Low risk	Unclear	Low risk	High risk
Bae *et al.* 2011[234]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Unclear	Unclear	Unclear	High risk
Bagcier *et al.* 2019[235]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Low risk	Unclear	Unclear	High risk
Bahr *et al.* 2006[131]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Balius *et al.* 2016[238]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Bang *et al.* 2000[239]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	Low risk
Başkurt *et al.* 2011[246]	Low risk	Unclear	High risk	Unclear	Low risk	Unclear	Low risk
Beaudreuil *et al.* 2012[705]	Unclear	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Bek *et al.* 2012[250]	Low risk	Unclear	High risk	High risk	Low risk	Low risk	Low risk
Bell *et al.* 2013[251]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Bennell *et al.* 2010[188]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk

continued

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Beyer *et al.* 2015[18]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Blume *et al.* 2015[699]	Unclear	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Boesen *et al.* 2017[162]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Boesen *et al.* 2019[163]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Boudreau *et al.* 2019[262]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Breda *et al.* 2020[696]	Low risk	Low risk	High risk	Low risk	Low risk	High risk	High risk
Brox *et al.* 1999[269]	High risk	High risk	High risk	High risk	No data	No data	No data
Buyuksireci *et al.* 2020[704]	Low risk	Unclear	High risk	Unclear	Low risk	Unclear	High risk
Cacchio *et al.* 2011[271]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Low risk
Calis *et al.* 2011[273]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	Unclear
Celik *et al.* 2009[279]	Unclear	Unclear	Low risk	Low risk	Low risk	Low risk	Low risk
Celik *et al.* 2009[278]	Unclear	Unclear	Unclear	Unclear	Low risk	Low risk	High risk
Celik *et al.* 2019[277]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	Unclear
Cha *et al.* 2014[702]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear
Chaconas *et al.* 2017[710]	Low risk	Unclear	Unclear	Low risk	High risk	Unclear	High risk
Chary-Valckenaere *et al.* 2018[283]	Low risk	Low risk	Unclear	Low risk	High risk	Low risk	Low risk
Chen *et al.* 2017[284]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Cheng *et al.* 2007[286]	High risk	High risk	Unclear	Unclear	Unclear	Unclear	High risk
Cho *et al.* 2017[289]	High risk	High risk	Unclear	Unclear	Low risk	Low risk	Unclear
Chung *et al.* 2004[290]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Clarke *et al.* 2010[294]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Conroy *et al.* 1998[298]	Unclear	Unclear	Unclear	Low risk	Low risk	Unclear	Low risk
Coombes *et al.* 2013[176]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
Croisier *et al.* 2007[304]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Low risk	Unclear	Unclear	High risk
de Jonge *et al.* 2008[309]	Unclear	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
de Miguel Valtierra *et al.* 2018[312]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
De Oliveira *et al.* 2020[712]	Low risk	Low risk	Low risk	Low risk	Low risk	High risk	High risk
de Vos *et al.* 2007[59]	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk	High risk
de Vos *et al.* 2010[314]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Dejaco *et al.* 2017[44]	Low risk	Low risk	Low risk	Low risk	Low risk	High risk	Low risk
Devereaux *et al.* 2016[326]	Low risk	High risk	High risk	High risk	High risk	Unclear	Low risk
Dimitrios *et al.* 2012[330]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dimitrios *et al.* 2013[331]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Dogan *et al.* 2010[333]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Dupuis *et al.*[339]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Eken Gedik *et al.* 2016[341]	Low risk	Low risk	Unclear	Low risk	Unclear	Unclear	High risk
Ellegaard *et al.* 2016[342]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Engebretsen *et al.* 2009[344]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Engebretsen *et al.* 2011[345]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Eraslan *et al.* 2018[342]	Low risk	Low risk	Unclear	Unclear	Unclear	Low risk	Unclear
Faria *et al.* 2006[354]	High risk	High risk	Unclear	Unclear	Unclear	Unclear	Unclear

continued

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Fournier Belley *et al.* 2018[164]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Ganderton *et al.* 2018[189]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
García *et al.* 2016[362]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	High risk
Gatz *et al.* 2020[365]	Low risk	Low risk	Low risk	Low risk	Unclear	Unclear	High risk
Genc *et al.* 2020[688]	Low risk	Low risk	High risk	High risk	Unclear	Unclear	High risk
Giray *et al.* 2019[368]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Granviken *et al.* 2015[374]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Gürsel *et al.* 2004[377]	Low risk	Low risk	Low risk	Unclear	Unclear	Unclear	High risk
Hallgren *et al.* 2017[258]	Unclear	Unclear	Low risk	Low risk	Low risk	Low risk	Low risk
Hallgren *et al.* 2014[383]	High risk	Low risk	High risk	Low risk	Unclear	Low risk	Low risk
Heron *et al.* 2017[390]	Low risk	Low risk	Low risk	Low risk	High risk	High risk	Low risk
Holmgren *et al.* 2012[393]	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk	High risk
Hotta *et al.* 2020[709]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Houck *et al.* 2015[397]	Low risk	Unclear	Unclear	High risk	Low risk	Low risk	Low risk
Ilhanli *et al.* 2015[695]	Low risk	Low risk	Unclear	Low risk	Unclear	Unclear	Low risk
Ingwersen *et al.* 2017[191]	Low risk	Low risk	Low risk	Low risk	Low risk	High risk	Low risk
Jasnauskaitė-Gedrimė *et al.* 2018[401]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	High risk
Jeong *et al.* 2008[711]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear
Johansson *et al.* 2005[405]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	High risk
Jonsson *et al.* 2005[186]	Unclear	Unclear	Low risk	Unclear	High risk	Unclear	High risk
Jonsson 2009[408]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Juul-Kristensen *et al.* 2019[412]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Kachanathu *et al.* 2019[413]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	High risk
Kang *et al.* 2019[416]	Low risk	Low risk	High risk	Low risk	High risk	High risk	High risk
Kedia *et al.* 2014[424]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Ketola *et al.* 2009[426]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	High risk
Ketola *et al.* 2013[706]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Kim *et al.* 2017[431]	Low risk	Unclear	Unclear	Low risk	Unclear	Low risk	Low risk
Kim *et al.* 2020[433]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	High risk
Knobloch *et al.* 2007[684]	Low risk	Low risk	Unclear	Unclear	High risk	Unclear	High risk
Knobloch *et al.* 2007[192]	Unclear	Unclear	High risk	Low risk	Unclear	Unclear	High risk
Knobloch *et al.* 2008[437]	Unclear	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Koç *et al.* 2020[708]	Low risk	Unclear	High risk	Low risk	Low risk	Unclear	Low risk
Kongsgaard *et al.* 2009[21]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Kromer *et al.* 2014[445]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Kromer *et al.* 2013[443]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Kulig *et al.* 2009[448]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Land *et al.* 2019[452]	Low risk	Low risk	Low risk	Low risk	High risk	Unclear	Low risk
Lee *et al.* 2017[697]	Low risk	Unclear	Unclear	Unclear	Low risk	Unclear	High risk
Lee *et al.* 2014[456]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Lee *et al.* 2017[459]	No data	No data	No data	No data	No data	No data	No data
Littlewood *et al.* 2016[34]	Low risk	Low risk	High risk	High risk	Unclear	Unclear	High risk

continued

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Ludewig *et al.* 2003[463]	Low risk	Unclear	High risk	Unclear	Low risk	Unclear	Low risk
Luginbuhl *et al.* 2008[174]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Maenhout *et al.* 2013[464]	Unclear	High risk	High risk	High risk	Low risk	Unclear	Low risk
Mafi *et al.* 2001[467]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Manias *et al.* 2006[469]	High risk	High risk	High risk	High risk	Low risk	Unclear	Unclear
Martinez-Silvestrini *et al.* 2005[471]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	High risk
Marzetti *et al.* 2014[472]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Mayer *et al.* 2007[474]	Unclear	Unclear	High risk	High risk	Unclear	Unclear	High risk
McCormack *et al.* 2016[478]	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk	Low risk
McGee *et al.* 1999[701]	Unclear	Unclear	Unclear	Unclear	High risk	Unclear	High risk
McQueen *et al.* 2020[694]	High risk	Unclear	Unclear	Unclear	High risk	Unclear	High risk
Melegati *et al.* 2000[480]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Menek *et al.* 2019[482]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	Unclear
Mulligan *et al.* 2016[489]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	High risk
Nazligul *et al.* 2018[493]	Low risk	Low risk	Low risk	Unclear	Low risk	Unclear	Low risk
Nishizuka *et al.* 2017[498]	Low risk	Low risk	High risk	Unclear	Low risk	Unclear	High risk
Nørregaard *et al.* 2007[499]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Notarnicola *et al.* 2014[500]	Not applicable (quasi)	Not applicable (quasi)	High risk	Unclear	Unclear	Unclear	High risk
Nowotny *et al.* 2018[501]	Low risk	Unclear	Low risk	Low risk	High risk	Unclear	High risk
Olaussen *et al.* 2015[506]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Østerås *et al.* 2009[512]	Low risk	Low risk	Unclear	High risk	Low risk	Unclear	Low risk

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Østerås *et al.* 2010[514]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	High risk
Paavola *et al.* 2018[516]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Park *et al.* 2010[521]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Pearson *et al.* 2012[525]	Unclear	Unclear	High risk	Unclear	Low risk	Unclear	High risk
Pearson *et al.* 2018[526]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	High risk
Pekgöz *et al.* 2020[707]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Pekyavas *et al.* 2016[527]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Low risk
Pérez-Merino *et al.* 2016[529]	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk	Low risk
Petersen *et al.* 2007[530]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Peterson *et al.* 2011[531]	Low risk	Low risk	Unclear	High risk	Low risk	Low risk	Low risk
Peterson *et al.* 2014[185]	Low risk	Unclear	Low risk	High risk	Low risk	Low risk	Low risk
Polimeni *et al.* 2003[698]	Unclear	Unclear	High risk	Low risk	Unclear	Unclear	Unclear
Praet *et al.* 2019[535]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Rabusin *et al.* 2020[686]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	High risk
Ramon *et al.* 2020[689]	Unclear	Unclear	Low risk	Low risk	Low risk	Unclear	High risk
Reyhan *et al.* 2020[549]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	High risk
Rhon *et al.* 2014[700]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
Rio *et al.* 2017[167]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	High risk
Rodríguez-Huguet *et al.* 2020[693]	Low risk	Low risk	Unclear	Low risk	Low risk	Low risk	Low risk
Rodríguez-Huguet *et al.* 2020[713]	Low risk	Low risk	Unclear	Low risk	Low risk	Low risk	Low risk

continued

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Røe *et al.* 2005[553]	No data	No data	No data	No data	No data	No data	No data
Romero-Morales *et al.* 2020[685]	Unclear	Unclear	Unclear	Unclear	Low risk	Low risk	High risk
Rompe *et al.* 2007[558]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Low risk
Rompe *et al.* 2008[687]	Low risk	Low risk	Unclear	Low risk	Low risk	Unclear	Unclear
Rompe *et al.* 2009[557]	Unclear	Low risk	High risk	High risk	Low risk	Unclear	Low risk
Rompe *et al.* 2009[559]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Roos *et al.* 2004[193]	Low risk	Unclear	Unclear	Low risk	Low risk	Unclear	Low risk
Rosety-Rodriguez *et al.* 2006[560]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Santamato *et al.* 2016[570]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	High risk
Scott *et al.* 2019[714]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
Şenbursa *et al.* 2011[582]	Low risk	Unclear	Unclear	Unclear	Low risk	Unclear	Low risk
Seven *et al.* 2017[583]	Low risk	Low risk	High risk	Low risk	High risk	Unclear	Low risk
Sevier *et al.* 2015[584]	Low risk	Unclear	High risk	High risk	High risk	Unclear	High risk
Silbernagel *et al.* 2001[587]	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Silbernagel *et al.* 2007[138]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	Low risk
Şimşek *et al.* 2013[591]	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear	Unclear
Slider *et al.* 2013[690]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	Unclear
Smidt *et al.* 2002[592]	Low risk	Low risk	High risk	High risk	Low risk	Unclear	Low risk
Söderberg *et al.* 2012[594]	Unclear	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Stasinopoulos and Manias 2013[692]	High risk	High risk	High risk	Low risk	Low risk	Unclear	High risk

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
Stasinopoulos *et al.* 2006[599]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2009[600]	Not applicable (quasi)	Low risk	High risk	Low risk	Unclear	Unclear	High risk
Stasinopoulos *et al.* 2010[601]	Not applicable (quasi)	Not applicable (quasi)	Low risk	Low risk	Low risk	Unclear	High risk
Stasinopoulos *et al.* 2017[597]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	High risk
Stefansson *et al.* 2019[184]	Low risk	Unclear	High risk	Low risk	High risk	Unclear	Low risk
Stergioulas *et al.* 2007[603]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Unclear
Stergioulas *et al.* 2008[604]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Steunebrink *et al.* 2013[605]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Stevens *et al.* 2014[175]	Unclear	Unclear	High risk	High risk	Unclear	Unclear	High risk
Struijs *et al.* 2004[608]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	High risk
Svernlov and Adolfsson 2001[614]	Not applicable (quasi)	Not applicable (quasi)	Unclear	Unclear	Unclear	Unclear	High risk
Tahran *et al.* 2020[618]	Low risk	Unclear	Low risk	Low risk	Low risk	Unclear	Low risk
Thijs *et al.* 2017[621]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Tonks 2012[623]	No data	No data	No data	No data	No data	No data	No data
Tonks *et al.* 2007[624]	Low risk	Low risk	Low risk	High risk	High risk	Low risk	Low risk
Tumilty *et al.* 2012[630]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Tumilty *et al.* 2016[632]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Turgut *et al.* 2017[633]	Low risk	Unclear	Unclear	Unclear	High risk	Unclear	Low risk
Tyler *et al.* 2010[636]	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear	High risk
Vallés-Carrascosa *et al.* 2018[638]	Low risk	Low risk	Low risk	High risk	Low risk	Low risk	High risk

continued

TABLE 61 Effectiveness review 3: Risk of bias results for the 204 included studies. Risk of bias assessments were made for each outcome in a study. The results presented here represent a summary, with the mode value selected (*continued*)

Author, year	Random sequence generation	Allocation concealment	Blinding of participants/ personnel	Blinding of outcome assessment	Incomplete outcome bias	Selective reporting	Other bias
van Der Vlist 2020[646]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
van Ark *et al.* 2016[644]	Low risk	Low risk	Low risk	Unclear	Unclear	Low risk	Low risk
Vinuesa-Montoya *et al.* 2017[641]	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk
Visnes *et al.* 2005[129]	Low risk	Low risk	High risk	Low risk	Unclear	Unclear	Unclear
Vuvan *et al.* 2019[187]	Low risk	Low risk	High risk	High risk	Low risk	Low risk	Low risk
Walther *et al.* 2004[161]	Unclear	Unclear	Unclear	Unclear	Low risk	Unclear	Unclear
Warden *et al.* 2008[652]	Low risk	Low risk	Low risk	Low risk	Low risk	Unclear	Low risk
Wegener *et al.* 2016[655]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	High risk
Wen *et al.* 2011[657]	Unclear	Unclear	Low risk	Unclear	High risk	Unclear	High risk
Werner *et al.* 2002[658]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Wiedmann *et al.* 2017[664]	Low risk	Low risk	Unclear	Unclear	Unclear	Unclear	High risk
Yazmalar *et al.* 2016[671]	Low risk	Unclear	Unclear	Unclear	Unclear	Unclear	High risk
Yeldan *et al.* 2009[672]	Low risk	Unclear	Unclear	Unclear	Unclear	Low risk	Low risk
Yelland *et al.* 2011[674]	Low risk	Low risk	High risk	Low risk	Low risk	Unclear	Low risk
Yerlikaya *et al.* 2018[675]	Low risk	Unclear	Low risk	Low risk	Unclear	Unclear	High risk
Young *et al.* 2005[132]	Unclear	Unclear	High risk	Low risk	High risk	Unclear	High risk
Yu *et al.* 2013[680]	Low risk	Low risk	Low risk	Unclear	Low risk	Unclear	Unclear
Yuruk *et al.* 2014[683]	Low risk	Low risk	Unclear	Unclear	Low risk	Unclear	Unclear

TABLE 62 Broad therapy class comparison: checklist of broad therapy class comparison. Table provides numbers of trials and outcomes across broad therapy classes and outcome domains

Tendinopathy	Outcome domain	Exercise plus non-exercise	Exercise-only	Non-exercise-only	Non-active
All	All	103 trials, 909 outcomes	100 trials, 1035 outcomes	50 trials, 450 outcomes	27 trials, 314 outcomes
All	Disability	91 trials, 311 outcomes	90 trials, 319 outcomes	42 trials, 111 outcomes	23 trials, 99 outcomes
All	Pain	69 trials, 282 outcomes	69 trials, 295 outcomes	36 trials, 132 outcomes	20 trials, 69 outcomes
All	Function	69 trials, 282 outcomes	69 trials, 295 outcomes	36 trials, 132 outcomes	20 trials, 69 outcomes
All	PFC	24 trials, 68 outcomes	24 trials, 83 outcomes	13 trials, 57 outcomes	9 trials, 42 outcomes
All	QoL	18 trials, 71 outcomes	18 trials, 71 outcomes	8 trials, 25 outcomes	6 trials, 17 outcomes

TABLE 63 Strength of evidence assessment for broad therapy class comparison

Outcome	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
All tendinopathies/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
All tendinopathies/ disability	Low risk	High risk	High risk	Low risk	Low risk	Low
All tendinopathies/ pain	Low risk	High risk	High risk	Low risk	Low risk	Low
All tendinopathies/ PFC	Low risk	High risk	High risk	Low risk	Low risk	Low
All tendinopathies/ QoL	Low risk	High risk	High risk	Low risk	High risk	Very low
All tendinopathies/ function	Low risk	High risk	High risk	Low risk	Low risk	Low

TABLE 64 Complete class comparison: Checklist of pairwise comparison of exercise-only with exercise and non-exercise class combinations. Table provides numbers of trials and outcomes across classes and outcome domains

Exercise + electro-therapy [95% CrI]	Exercise + injection [95%CrI]	Exercise + kinetics [95% CrI]	Exercise + surgery [95% CrI]	Exercise + MT [95% CrI]	Exercise + non-active [95% CrI]	Outcome domains	Tendinopathy
12 trials, 69 outcomes	7 trials, 67 outcomes	16 trials, 156 outcomes	12 trials, 189 outcomes	13 trials, 110 outcomes	5 trials, 37 outcomes	All	All
12 trials, 32 outcomes	5 trials, 19 outcomes	14 trials, 48 outcomes	12 trials, 63 outcomes	10 trials, 38 outcomes	5 trials, 16 outcomes	Disability	All
7 trials, 20 outcomes	5 trials, 20 outcomes	16 trials, 156 outcomes	11 trials, 80 outcomes	9 trials, 33 outcomes	3 trials, 13 outcomes	Pain	All
3 trials, 5 outcomes	2 trials, 8 outcomes	5 trials, 23 outcomes	1 trial 6 outcomes	3 trials, 12 outcomes	2 trials, 6 outcomes	PFC	All
0 trials, 0 outcomes	1 trial 4 outcomes	5 trials, 10 outcomes	0 trials, 0 outcomes	5 trials, 18 outcomes	1 trial 2 outcomes	Function	All

TABLE 65 Strength of evidence assessment complete class comparison with exercise-only as the reference

Therapy class	Outcome	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Exercise + electro-therapy	All tendi-nopathies/ all outcomes	Low risk	High Risk	High risk	Low risk	Low risk	Low
Exercise + injection	All tendi-nopathies/ all outcomes	Low risk	Low risk	High risk	Low risk	Low risk	Moderate
Exercise + kinetics	All tendi-nopathies/ all outcomes	High risk	Low risk	Low risk	Low risk	Low risk	Moderate
Exercise + surgery	All tendi-nopathies/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
Exercise + MT	All tendi-nopathies/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
Exercise + non-active	All tendi-nopathies/ all outcomes	Low risk	High risk	High risk	Low risk	Low risk	Low
Exercise + electro-therapy	All tendi-nopathies/ disability	Low risk	High risk	High risk	Low risk	High risk	Very low
Exercise + injection	All tendi-nopathies/ disability	Low risk	Low risk	High risk	Low risk	Low risk	Moderate
Exercise + kinetics	All tendi-nopathies/ disability	Low risk	Low risk	Low risk	Low risk	Low risk	High
Exercise + surgery	All tendi-nopathies/ disability	Low risk	High risk	High risk	Low risk	Low risk	Low

TABLE 65 Strength of evidence assessment complete class comparison with exercise-only as the reference (*continued*)

Therapy class	Outcome	Overall RoB	Inconsistency	Imprecision	Indirectness	Small-study effects	Strength of evidence
Exercise + MT	All tendinopathies/ disability	Low risk	Low risk	High risk	Low risk	Low risk	Moderate
Exercise + non-active	All tendinopathies/ disability	Low risk	High risk	High risk	Low risk	High risk	Very low
Exercise + electrotherapy	All tendinopathies/ pain	Low risk	High risk	High risk	Low risk	High risk	Very low
Exercise + injection	All tendinopathies/ pain	Low risk	Low risk	High risk	Low risk	Low risk	Moderate
Exercise + kinetics	All tendinopathies/ pain	High risk	High risk	High risk	Low risk	Low risk	Very low
Exercise + surgery	All tendinopathies/ pain	Low risk	High risk	High risk	Low risk	High risk	Very low
Exercise + MT	All tendinopathies/ pain	Low risk	High risk	High risk	Low risk	Low risk	Low
Exercise + non-active	All tendinopathies/ pain	Low risk	High risk	High risk	Low risk	Low risk	Low
Exercise + kinetics	All tendinopathies/ PFC	High risk	High risk	High risk	Low risk	Low risk	Very low
Exercise + MT	All tendinopathies/ PFC	Low risk	High risk	High risk	Low risk	Low risk	Low
Exercise + kinetics	All tendinopathies/ function	High risk	High risk	High risk	Low risk	Low risk	Very low
Exercise + MT	All tendinopathies/ Funmction	Low risk	High risk	High risk	Low risk	Low risk	Low

Appendix 7 Studies included in mixed-methods review

TABLE 66 Studies included in mixed-methods review: characteristics and results

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
Rotator cuff							
Barrett 2018[154]	Qualitative Qualitative descriptive	Hospital outpatient physiotherapy (Ireland)	*n* = 23 patients 8 males Age 62.5 Symptoms 25.3 months	6-week group exercise class + HEP	Experiences and perceptions of group-based exercise Semi-structured telephone interviews		Themes: (i) support, motivation and learning from peers; (ii) preference for exercise class compared to individual physiotherapy; (iii) the physiotherapist as an educator and facilitator; (iv) beliefs about pain and exercise
Bateman 2014[248]	Quantitative RCT (feasibility)	HEP (UK)	*n* = 11 patients 6 males Age 53.5 Symptoms NR	8-week eccentric rotator cuff exercises vs. concentric strengthening vs. no exercises	Adherence Diary	NA	Mean Adherence = 86% (of five patients who returned diaries)
Bennell 2010[188]	Quantitative RCT	Clinic and HEP (Australia)	*n* = 120 patients 64 males Age 60 Symptoms (median) 19 months	12-week HEP + MT vs. placebo	Adherence and attendance Log book (adherence), number of physiotherapy session (attendance)	Tolerability Reporting of events	Adherence (HEP overall): 82% during intervention period vs. 70% during follow-up; attendance: 91% attended in active group vs. 93% in placebo; tolerability: 10-weeks physiotherapy + HEP (12/55, 22%) reported increased pain with home exercise); 12-week HEP period (7/49 (14%) reported short-term pain with home exercise
Boudreau 2019[262]	Quantitative RCT	HEP (Canada)	*n* = 42 patients 20 males Age 49.9 Symptoms 43 months	6-week HEP of scapular strengthening + rotator cuff muscles vs. rotator cuff strengthening + coactivation	Adherence Log book	NA	Adherence rate = 85.7% (overall)

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
Conroy and Hayes 1998[298]	Quantitative RCT (pre/post control)	Physiotherapy clinic and HEP (USA)	*n* = 14 patients 8 males Age 52.9 Symptoms NR	3-week joint mobilisation + comprehensive treatment (hot pack, active ROM, stretching, strengthening, mobilisation, education) vs. comprehensive treatment only	Adherence and Attendance Log (Adherence), Number of attended physiotherapy sessions (Attendance)	NA	Adherence: 82% for both groups; attendance: 96% for both groups
Cook 2014[172]	Quantitative RCT	Outpatient clinic and academic centres (USA)	*n* = 68 patients 37 males Age 52.6 Symptoms 2.7 months	Duration NR. Shoulder treatment (MT, stretching, isotonic strengthening) + neck mobilisations vs. should treatment only	Adherence Score at discharge	Satisfaction Patient Acceptable Symptom Scale (PASS)	Adherence: high (51% overall; 49% shoulder/neck; 55% shoulder), compliant (41% overall; 43% shoulder/neck, 39% shoulder), not (3% overall; 0% shoulder/neck; 6% shoulder), extremely not (4% overall, 8% shoulder/neck; 0% shoulder); satisfaction: all = 56 acceptable vs. 10 unacceptable; shoulder and neck group = 27 acceptable vs. 3 unacceptable
Dejaco 2016[44]	Quantitative RCT	Sports medical centre and HEP (Netherlands)	*n* = 36 patients 19 males Age 49.5 Symptoms 19.7 months	Duration NR. Participants allocated to eccentric exercise vs. conventional exercise	Adherence Journal	NA	Adherence eccentric group 92% vs. 91% in conventional
Dupuis 2018[339]	Quantitative RCT	HEP (Canada)	*n* = 43 patients Sex NR Age 38.3 Symptoms < 1 month	6-week intervention consisting of gradual loading + strengthening (resisted isotonic) vs. rest + cryotherapy + strengthening	Adherence Diary	NA	Week 2: 33.6/42 sessions cryotherapy group vs. 31.9/42 gradual reloading exercises; week 6: 19.5/28 days cryotherapy group vs. 11.4/28 for exercise group

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
Flores 2017[183]	Quantitative RCT	Physiotherapy centre (Spain)	*n* = 84 patients 44 males Age 40.2 Symptoms NR	Duration NR. Physiotherapy (stretching and strengthening) + subacromial HA injections vs. physiotherapy only	NA	Tolerability Self-report	Patients' perception of tolerability: day 7 = >2.5 (same as injection group); day 15 = 3.0 (same as injection group); day 30 = >3.0 (injection group higher); Day 90 = >3.0 (injection group higher)
Ferrer 2018[177]	Quantitative Cohort	Supervised (NR), HEP (USA)	*n* = 5 patients 1 male Age 60.2 Symptoms NR	12-week exercise intervention (first 6 weeks supervised, last HEP including isometric, active range of movement, progressive resistance)	Adherence Log	NA	100% completed programme. One patient showed poor compliance with the HEP protocol and did not give maximal effort during supervised exercise therapy sessions as determined by supervising physical therapist
Fournier Belley 2018[164]	Quantitative RCT	Treatment session NR and HEP (Canada)	*n* = 40 patients 22 males Age 45.5 Symptoms 10.2 months	6-week rehabilitation programme (sensorimotor training, education, strengthening) + a-tDCS vs. rehabilitation programme + sham a-tDCS	Adherence and attendance Log book (Adherence), NR (Attendance)	NA	Adherence = 86% (between weeks 6 and 12 for HEP overall); attendance: mean attendance rate = 98.75% (4 physical therapy sessions missed, 3 by participant who dropped out)
Granviken 2015[374]	Quantitative RCT	Physiotherapy outpatient clinic and HEP (Norway)	*n* = 46 patients 24 males Age 47.9 Symptoms (median) 20.5 months	6-week HEP (scapular stabilisation, rotator cuff exercises, pain-free ROM) + 1 supervised session vs. 10 supervised sessions + HEP	Adherence and attendance Diary (adherence), number of supervised sessions attended (attendance)	NA	Adherence: 88% for HEP vs 80% for supervised group + HEP; attendance: 8/10 treatments (median)

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
Hanratty 2016[155]	Qualitative Qualitative descriptive	NHS and private practice musculo-skeletal outpatient departments and orthopaedics, rheumatology and sports medicine clinics (Northern Ireland and Republic of Ireland)	*n* = 20 physical therapists 2 males All ≥ 5-y postgraduate experience and formal postgraduate training MT	Exercise for SIS	Perceptions of the use and types of exercises commonly used in SIS Focus groups		Exercise was key in SIS management. Overarching theme: the need to 'gain buy-in to exercise' at an early stage; main subtheme; patient education
Heron 2017[390]	Quantitative RCT	Outpatient physiotherapy department and HEP (UK)	*n* = 120 patients 71 males Age 49.9 Symptoms 3 months–1 year (*n* = 78), > 1 year (*n* = 42)	6-week three dynamic rotator cuff loading programmes (open chain, closed chain, range of movement)	Adherence Diary	NA	% of prescribed exercise completed Range of movement (14 returned diaries): 12 (86%) completed 76–100%; 2 (14%) completed 51–75%; open chain (12 returned diaries) 10 (83%) completed 76–100%, 2 (17%) completed 51–75%); closed chain (13 returned diaries) 11 (85%) completed 76–100%, 1 (8%) completed 51–75%, 1 (8%) completed 26–50%
Holmgren 2012[393]	Quantitative RCT	Hospital orthopaedics department and HEP (Sweden)	*n* = 97 patients 61 males Age 52 Symptoms 18.5 months	12-week HEP (eccentric strengthening for rotator cuff, concentric/eccentric for scapular, manual mobilisation) vs. unspecific movement exercises (control)	Adherence and attendance Diary (adherence), session schedule (attendance)	NA	Adherence: specific exercise group 44 patients missed < 15 days vs. 40 in control group; attendance: in specific exercise and control (non-specific exercise) groups, 80% attended target number of visits
Ingwersen 2017[191]	Quantitative RCT	Clinic and HEP (Denmark)	*n* = 100 patients 52 males Age 46.1 Symptoms 12.0 months	12-week exercise programme PHLE vs. LLE (initial instruction, supervised, and HEP) + concomitant corticosteroid injection	Adherence Diary	Tolerability Increased pain, decreased strength	Adherence: 57% compliance in PHLE group vs. 61% in LLE; tolerability (pain): 13/49 (27%) of patients in the PHLE group and 18/51 (35%) in LLE

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Juul-Kristensen 2019[412]	Quantitative RCT	Supervised exercises NR and HEP (Denmark)	*n* = 49 patients 24 males Age 42.9 Symptoms > 1 month	8-week BIONEX exercises (scapular focussed) vs. scapular exercises without EMG-biofeedback	Adherence and attendance Diary (adherence), attendance to sessions (attendance)	NA	Adherence = 86% for BIONEX vs. 88% for exercises without feedback; attendance: 86% attendance for BIONEX vs. 88% for exercises without feedback
Kim 2019[432]	Quantitative RCT (prospective non-randomised)	HEP (South Korea)	*n* = 30 patients 33 males Age 54.65 Symptoms NR	Duration NR. PRP vs. rotator cuff strengthening exercises	Adherence Self-report	NA	Adherence in exercise group at 6 weeks 90.8% vs. 94.2% at 12 weeks vs. 87.4% at 24 weeks
Kromer 2013[443]	Quantitative RCT	Outpatient physiotherapy clinic and HEP (Germany)	*n* = 90 patients 64 males Age 51.8 Symptoms > 24 months	12-week exercise intervention with individually adapted exercises +examination-based physiotherapy vs. exercises only	Adherence Log book	NA	Mean exercise frequency per week = 5.5 and during HEP period 3.8 for the intervention and 3.9 for the control group (98.9% returned complete log book after 5 weeks, 94.4% after 12 weeks)
Kvalvaag 2018[450]	Quantitative RCT	NR (Norway)	*n* = 143 patients 65 males Age 46.8 Symptoms 3–6 months (*n* = 29), 6–12 months (*n* = 37), 12–24months (*n* = 27), 24 + months (*n* = 50)	10-week intervention consisting of RSWT + supervised exercises (scapular positioning + guided movements) vs. sham + supervised exercises	Attendance Measurement NR	NA	RSWT attendance = 14/20 (70%) (median) treatments (range 2–21) vs. 13/20 (65%) for sham (range 2–20)
Littlewood 2014[156,*]	Qualitative Qualitative descriptive Mixed-methods	One private physiotherapy clinic (UK)	Patients: *n* = 6 3 males Age 64.7 Physiotherapists: *n* = 2 0 males Age NR >20-y postgraduate experience	Self-managed single loaded exercise programme for rotator cuff tendinopathy	Perceived barriers to loaded exercise for rotator cuff tendinopathy Semi-structured interviews		Themes: (i) expectations and preferences, (ii) characteristics of an unsuccessful outcome, (iii) characteristics of a successful outcome

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Littlewood 2015[107,**]	Qualitative Qualitative descriptive	NHS physiotherapy departments (UK)	*n* = 13 physiotherapists 7 males 1–32 y postgraduate experience	Self-managed single loaded exercise programme for rotator cuff tendinopathy	Perceptions of potential implementation barriers and facilitators to self-managed loaded exercise in the context of the UK NHS Semi-structured interviews		Themes: (i) the physiotherapists preferred therapeutic option; (ii) the role of the physiotherapist; (iii) attributes of the intervention; (iv) attitude to symptom response; (v) response to therapy; (vi) continuing professional development
Littlewood 2014[460,*]	Quantitative RCT (pilot)	Clinic and HEP (UK)	*n* = 24 patients 12 males Age 63.2 Symptoms 38.6 months	12-week programme of self-managed loaded exercise (exercises against gravity, band or hand weight) vs. usual physiotherapy treatment	Adherence Diary	NA	Overall adherence = 90%. Adherence = 89% for 7/11 who returned complete data vs. 93% of those who returned partial
Littlewood 2016[34,**]	Quantitative RCT	NR (UK)	*n* = 86 patients 43 males Age 54.7 Symptoms (range) 3–120 months	12-week self-managed loaded exercises	Adherence Diary	NA	Overall adherence = 78%
Malliaris 2020[715]	Quantitative RCT (pilot and feasibility trial)	Online intervention and HEP (Australia)	*n* = 36 patients 4 males Age 53.9 Symptoms 34.6 months	12-week exercise intervention (shoulder elevation; external rotation) delivered online vs. advice only vs. recommended care vs. recommended care + exercises	Adherence Questionnaire	NA	92% adherence in recommended care group vs. 67% in without-telerehabilitation group. 33% of people in recommended care without telerehabilitation performed no exercise at all
de Oliveira 2020[703]	Quantitative RCT	Physical therapy session NR and HEP (Canada)	*n* = 52 patients 30 males Age 30.15 Symptoms 22.6 months	6-week rehabilitation (physical therapy sessions – sensorimotor training) + kinesiotherapy vs. rehabilitation	Adherence and attendance Log book (adherence), attendance at sessions (attendance)	NA	Adherence: 90.4% for HEP overall; attendance: 92.5% to physical therapy sessions overall

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
Roddy 2021[109]	Quantitative RCT	HEP (UK)	*n* = 256 patients 123 males Age 53.8 Symptoms NR	12–16-week intervention with following groups: ultrasound-guided corticosteroid injection + physio-therapist-led exercise vs. ultrasound-guided corticosteroid injection + exercise leaflet vs. unguided corticosteroid injection + physiotherapist-led exercise vs. unguided corticosteroid injection + exercise leaflet	Adherence and attendance Postal questionnaire (adherence), nr (attendance)	Satisfaction and tolerability Postal questionnaire (satisfaction and tolerability)	Adherence: greater in physiotherapist-led exercise group than the leaflet group at 6 weeks (85.6% vs. 64.1%) and 6 months (63.2% vs. 50.8%) but not at 12 months (48.9% vs. 53.2%); attendance: 12/128 attended no physiotherapy appointments, 42/128 attended 1–5 sessions, 71/128 6–8 sessions as per protocol + 3/128 9–10 session; satisfaction: confidence and satisfaction greater in supervised exercise group compared to unsupervised; tolerability: exacerbation of shoulder pain after performing exercises 59 (60%) supervised and 60 (59%) unsupervised exercise. Improved within a couple of hours in 22 (37%) supervised and 21 (36%) unsupervised
Sandford 2017[157]	Qualitative Qualitative descriptive	NHS and Home (UK)	*n* = 12 patients 6 males Age 54.8 Symptoms 9.8 months	8-weeks class-based exercise programme with complementary HEP	Factors affecting adherence Semi-structured interviews		Main enablers: equipment, perceived benefit, longer/more intensive monitoring Main barriers: lack of motivation and equipment, pain
Seitz 2019[165]	Quantitative Prospective case–control pilot study	HEP (USA)	*n* = 25 patients and healthy controls 10 males Age 30 Symptoms NR	Duration NR. All participants completed prone horizontal abduction exercise	Adherence	NA	Adherence painful group = 83.1% vs. 79.1% in control group
Turgut 2017[633]	Quantitative RCT	NR (Turkey)	*n* = 30 patients 16 males Age 36.5 Symptoms 6.3 months	12-week exercises intervention of shoulder girdle stretching + strengthening + scapular stabilisation (intervention) vs. shoulder girdle stretching + strengthening only (control)	Adherence Diary	NA	Adherence of 91% for intervention group vs. 93.5% for control

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Turgut 2018[634]	Quantitative Quasi-RCT (pre/post single group)	HEP (Turkey)	*n* = 18 patients Sex NR Age 34 Symptoms 5.8 months	6-week exercise intervention (stretching)	Adherence Diary	NA	Adherence (mean) = 93.5% (overall)
Walther 2004[161]	Quantitative RCT	Physiotherapy NR and HEP (Germany)	*n* = 60 patients 34 males Age 50.7 Symptoms 27 months	12-weeks self-training centring and stretching exercises vs. conventional physiotherapy vs. functional brace	NA	Tolerability Drop-outs and adverse events	No drop-outs from exercise
White 2020[159]	Qualitative Qualitative descriptive	Sports medicine surgery and physical therapy (Australia)	*n* = 80 expert clinicians Sex NR Age NR ≥ 10 yr postgraduate experience Published on shoulder tendinopathy past 5-years	Management of rotator cuff tendinopathy	Expert shoulder clinician-researchers' experiences with managing rotator cuff tendinopathy including practice beliefs towards providing education In-depth semi-structured interviews		Themes: (i) the need for early, focussed education; (ii) developing therapeutic alliance; (iii) what is required moving forward in current day rotator cuff tendinopathy management
Achilles							
Bell 2013[251]	Quantitative RCT	Sports medicine clinic and HEP (New Zealand)	*n* = 53 patients 29 males Age 49 Symptoms NR	12-week eccentric calf-training programme + blood injection (treatment) or needling only (control)	Adherence Diary	NA	Adherence treatment group = 65% vs. 62% control
Beyer 2015[18]	Quantitative RCT	Fitness centre and HEP (Denmark)	*n* = 57 patients 32 males Age 48 Symptoms 18 months	12-week eccentric exercise training vs. heavy slow resistance training	Adherence Diary	NA	Reported adherence 78% in eccentric group vs. 92% in heavy slow group

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Boesen 2017[162]	Quantitative RCT	HEP (Denmark)	*n* = 60 patients 60 males Age 41.96 Symptoms NR	12-week eccentric exercise programme + high volume injection or platelet rich plasma injection or placebo	Adherence Diary	NA	70% of the patients performed more than 75% of the recommended reps; remaining 30% performed between 50% and 75% of the recommended reps
Boesen 2019[163]	Quantitative RCT	HEP (Denmark)	*n* = 28 patients 28 males Age 43 Symptoms 10.1 months	24-week eccentric exercise programme + high-volume guided injection with corticosteroid or high-volume guided injection without corticosteroid	Adherence Follow-up	NA	79% (22/28) performed > 75% of recom-mended reps
Hasani 2021[152]	Qualitative Interpretive description	Community (gym-based), with 1 of 3 weekly sessions supervised by physiotherapist using videoconference software (Australia)	*n* = 8 patients males NR Age 46.1 Symptoms NR *n* = 7 physiotherapists male = 5 Age = 34.1	12-weeks gym-based exercise programme of standing and sitting calf-raises using Smith machine	Experiences, barriers and enablers Semi-structured interviews (patients) Focus groups (physiotherapists)		Overall satisfaction and acceptability of telehealth monitoring Key themes: acceptability of telehealth; enablers to telehealth adherence; barriers to telehealth adherence; enablers to gym-based exercise adherence; barriers to gym-based exercise adherence
Herrington and McCulloch 2007[391]	Quantitative RCT (pilot)	HEP (UK)	*n* = 25 patients Sex NR Age 36.8 Symptoms 24.3 months	12-week eccentric loading programme + deep friction mas-sage, MT + stretches vs. deep friction massage, MT, deep friction (only)	Adherence Diary	NA	100% adherence to exercise in all groups
Horstmann 2013[16]	Quantitative RCT	NR (Germany)	*n* = 58 patients 32 males Age 46 Symptoms NR	12-week whole body vibration vs. eccentric training vs. wait-and-see	Adherence Diary	NA	Adherence (whole body vibration) = 2.2/3 per week vs. 3/3 for eccentric

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
de Jonge 2015[308]	Quantitative Cohort	HEP (Netherlands)	*n* = 80 patients 44 males Age 50.3 Symptoms 7.4 months	12-week stretching and eccentric exercise programme + PRP injection or placebo	Adherence Measurement NR	NA	Mean adherence 72.8% (overall)
Jonsson and Alfredson 2005[186]	Quantitative RCT (prospective randomised study)	HEP (Sweden)	*n* = 15 patients 13 males Age 26 Symptoms NR	12-week eccentric quadriceps training vs. concentric quadriceps training	NA	Tolerability Drop out	3/9 (33%) in concentric group dropped out of concentric group due to severe tendon pain during and after training
Knobloch 2007[192]	Quantitative RCT	HEP (Germany)	*n* = 20 patients 11 males Age 32.5 Symptoms NR	12-week eccentric training vs. conventional repetitive cryotherapy	NA	Acceptability Follow-up telephone calls	Participants reported that the daily programme of about 5-minutes was easy to implement into their daily activities (no data reported)
Knobloch 2010[182]	Quantitative Cohort	HEP (Germany)	*n* = 75 patients 38 males Age NR Symptoms 7 months	12-week eccentric exercise programme	Adherence Telephone call, log book, follow-up examination	Willingness Self-report	Adherence: 80% over 12 weeks; willingness: 20% non-compliant (*n* = 12), 25% (4/12) reported drop-off due to overwhelming pain
Mantovani 2020[181]	Quantitative Single-cohort feasibility study	Private physiotherapy clinic (Italy)	*n* = 19 patients 12 males Age 39.2 Symptom duration 22.7 months	Duration NR. Heavy isometric exercise sequence	NA	Tolerability, willingness and satisfaction with intervention Self-report	Tolerability: mean tolerability 6.3 ± 2.2; Willingness:100% (17 participants) answered yes; satisfaction: no adverse events, discomfort, or inconveniences reported
Masood 2014[166]	Quantitative Longitudinal cohort	HEP (Finland)	*n* = 20 (patients and healthy controls) 14 males Age 27.75 Symptoms 10.4 months	12-week eccentric exercise group vs. control (no exercise)	Adherence Diary	NA	Adherence = 90% required days completed, 81% overall training sessions

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
Mc Aulife 2017[153]	Qualitative Interpretive description	Running clubs and local community (Ireland)	*n* = 8 patients 5 males Age 40 Symptoms 20.5 months	Recruited as part of RCT investigating 12-week exercise intervention	Experience in managing AT Semi-structured telephone interviews		Contrasting views on expected role of exercise and confidence in proposed exercise intervention
Morrissey 2011[716]	Quantitative RCT	HEP (UK)	*n* = 38 patients 14 males Age 21.4 Symptoms NR	6-week eccentric or concentric training protocol	Adherence Diary	NA	Adherence = 45.74% for eccentric group vs. 48.46% for concentric
Munteanu 2014[490]	Quantitative RCT	HEP (Australia)	*n* = 140 patients 78 males Age 43.6 Symptoms 31.6 months	12-week eccentric calf-muscle exercise + customised foot orthosis or sham	Adherence Diary	NA	Both groups adhered to approximately 57% of exercise
Rabusin 2020[686]	Quantitative RCT	HEP (Australia)	*n* = 100 patients 48 males Age 45.9 Symptoms NR	12-week exercise intervention of heel lifts or eccentric exercise	Adherence Questionnaires	NA	Adherence weeks 1–2 = 79%; weeks 3–6 = 67%; weeks 7–12 = 60% (overall)
Ram 2013[546]	Quantitative Quasi-RCT (longitudinal cohort study)	HEP (Canada)	*n* = 48 patients 19 males Age 39.4 Symptoms > 3 months	12-week training programme based on Alfredson protocol	Adherence Log book	NA	17/20 participants completed > 80% of exercise programme; 3 participant non-compliant due to extreme pain caused by the exercises
Rompe 2008[687]	Quantitative RCT	HEP (Germany)	*n* = 50 patients 20 males Age 39.8 Symptoms 25.5 months	12-week eccentric loading programme vs. repetitive low-energy shockwave therapy	Adherence Measurement NR	NA	21/25 completed exercises daily (in exercise group), twice per day

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Roos 2004[193]	Quantitative RCT	HEP (Sweden)	*n* = 44 patients 21 males Age 45 Symptoms (median) 5.5 months	12-week eccentric exercises vs. night splint vs. eccentric exercises + night splint	Adherence Diary	Tolerability Reported side-effects	Feasibility: adherence good (> 75%) for first 7 weeks in eccentric group, at 12 weeks only 50% good compliance; tolerability: 33% reported muscle soreness with eccentric exercise in first week; no difference between exercise and exercise + splint groups. None reported muscle soreness by 6 weeks but 1/16 (6.3%) reported calf stiffness during the day
Sancho 2019[178]	Quantitative Single-cohort feasibility study	Private physiotherapy clinic and HEP (Australia)	*n* = 15 patients 15 males Age 37.9 Symptoms ≥1 month	12-weeks education + pain-guided progressive exercise (isometrics, isotonics, hopping, running)	Adherence and fidelity Exercise diary	Satisfaction with intervention Questionnaire	Adherence 70% Fidelity 50% Barriers: time Enablers: education, perceived benefit, feedback frequency
Solomons 2020[595]	Quantitative RCT	Clinic and HEP (Canada)	*n* = 52 patients 24 males Age NR Symptoms 18 months	12-week standardised exercise programme (progressive isometric, concentric, eccentric, kinetic chain) only (group 1) + intramuscular dry needling (group 2) or sham needling (group 3)	Adherence Diary	NA	Adherence (> 75% of sessions) = 100% group 1, 92% group 2, 83% group 3
Stefansson 2019[184]	Quantitative RCT	Clinic and HEP (Iceland)	*n* = 60 patients 12 males Age NR Symptoms NR	12-week eccentric exercise protocol (group 1) vs. pressure massage (group 2) vs. pressure massage + eccentric exercise (group 3)	NA	Tolerability Drop out	2/19 (11%) dropped out of eccentric group due to exercises aggravating symptoms; 1/21 (4.8%) dropped out of pressure massage and 2/20 (10%) dropped out of combination but no reason provided
Stevens 2014[175]	Quantitative RCT	NR (UK)	*n* = 28 patients 11 males Age 48.7 Symptoms 7.4 months	6-week do-as-tolerated exercise protocol (eccentric) vs. standard	Adherence Completed exercises as planned	NA	Standard (180 reps) adherence: 92% target reps; do-as-tolerated: 62% target reps, with similar clinical outcomes

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Tumilty 2012[630]	Quantitative RCT	Clinic and HEP (New Zealand)	*n* = 40 patients 18 males Age 45.05 Symptoms NR	12-week eccentric exercise programme + active or placebo (low-level laser therapy)	Adherence Log	NA	Mean sessions completed = 81/168 for laser group vs. 106/168 for placebo
Tumilty 2016[632]	Quantitative RCT	HEP (New Zealand)	*n* = 80 patients 33 males Age 47.5 Symptoms NR	12-week exercise intervention with two regimes (unilateral heavy-load eccentric plantar flexion) + placebo (+ exercise regime 1 (group 1) or 2 (group 3)) or laser (+ exercise regime 1 (group 2) or 2 (group 4))	Adherence Training log	NA	Training logs returned: 7 in group 1, 13 in group 2, 14 in group 3, 12 in group 4; reduced exercise regime adherence = 100% vs. Alfredson protocol 70%
Verrall 2011[149]	Quantitative RCT	HEP (Australia)	*n* = 190 patients 108 males Age 39 Symptoms ≥ 3 months	6-week progressive eccentric heel-drop programme followed by return to sport/ main activity + continued exercise	Adherence Direct question on whether they completed exercise regime	NA	86% completed programme, 8% ceased due to perceived programme failure, 6% ceased due to perceiving it to have been successful before 6-week period over
van der Vlist 2020[646]	Quantitative RCT	General hospital (Sports medicine department) (Netherlands)	*n* = 80 39 male patients Age 47.9 Symptom > 14 months	24-week exercise programme (isometric, concentric, eccentric) + high-volume injection of saline and lidocaine or placebo injection	Adherence Daily log	NA	The median percentage of performed exercises was 76% in the high-volume injection group vs. 72% in placebo
de Vos 2007[59]	Quantitative RCT	HEP (Netherlands)	*n* = 63 patients 37 males Age 44.6 Symptoms 30.7 months	12-week heavy-load eccentric training programme vs. exercise + night-splint	Adherence Diary	NA	Adherence exercise only group = 72% (excellent/good) and 28% moderate/ poor vs. 74% (excellent/good) and 26% moderate/poor for combined

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
de Vos 2010[314]	Quantitative RCT	HEP (Netherlands)	*n* = 54 patients 26 males Age 49.5 Symptoms (median) 16 months	12-week eccentric exercise programme (usual care) + PRP injection or saline	Adherence Log	NA	Adherence in PRP = 70.9% vs. 74.6% in placebo
Wetke 2015[660]	Quantitative Quasi-RCT (prospective trial)	HEP (Denmark)	*n* = 93 patients 50 males Age 48.8 Symptoms 13 months	12-week rehabilitation regime (eccentric/concentric exercises – group 0) + ultrasound-guided injections	Adherence Self-report	NA	65% of patients answered yes at all four visits (100% compliance) – of these 75% in group 0 (no GCS injections) and 61% in the remainder; 88% answered yes at three visits (75% compliance) 92% in group 0, 87% in the remainder
Yelland (Yellend *et al.*, 2009) 2009	Quantitative RCT	Primary care centre and HEP (Australia)	*n* = 43 patients Sex NR Age (median) 46 Symptoms (median) 6 months	12-week eccentric loading exercises vs. prolotherapy vs. loading exercises + prolotherapy	Adherence Diary	NA	Eccentric group: moderate (25% to 50%) *n* = 1, good (50% to 75%) *n* = 2 and excellent (>75%) *n* = 4; combined: moderate *n* = 1, good *n* = 3, excellent *n* = 5
Patellar							
Agergaard 2021[180]	Quantitative RCT	Commercial fitness centre (Denmark)	*n* = 44 patients 44 males Age 30.5 Symptoms 25.15 months	12-week moderate slow resistance programme vs. heavy slow resistance	Adherence, attendance and fidelity Training diary	NA	Adherence: heavy slow group = 78% vs. 86% for moderate; attendance: heavy slow group = 81% vs. 86% for moderate; fidelity: 76.8% (heavy slow) vs. 84.5% (moderate) for leg press exercises and time under tension 79.0% (heavy) vs. 85.3% (moderate); 72.9% (heavy slow) vs. 80.3% (moderate) for knee extension and time under tension 77.1% (heavy) vs. 83.4% (moderate); both exercises performed > 90% of load prescribed
van Ark 2013[170]	Quantitative Case-series	University sports medicine centre + HEP (Netherlands)	*n* = 5 patients 2 males Age 27 Symptoms 38.4 months	PRP injection + 12-week 5-phase graded exercise programme guided by correct execution and pain <5/10 VAS	Adherence Self-report single question on 1–10 scale	NA	Mean compliance 7/10 (overall); non-compliance was due to lack of time, motivation or holidays, other injuries

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/ tools)	Results
Bahr 2006[131]	Quantitative RCT	Olympic training centre and HEP (Norway)	*n* = 35 patients 35 males Age 30.5 Symptoms 25.15	12-week eccentric training (squats) programme vs. surgical treatment + eccentric programme	Adherence Measurement NR	NA	Adherence eccentric training group: 66% of prescribed dose vs. 72% of prescribed dose in surgery group
Breda 2020[696]	Quantitative RCT	University medical centre and HEP (Netherlands)	*n* = 76 patients 58 males Age 24 Symptoms 24 months	24-week intervention for eccentric exercise vs. progressive tendon-loading exercises	Adherence Online questionnaire	NA	Adherence tendon-specific exercises 47% for progressive vs. 53.1% after 12 weeks and 40.2% vs. 48.6% after 24 weeks; adherence exercises targeting risk factors 27.5% for progressive vs. 28.2% for eccentric at 12 weeks and 21.4% vs. 21.6% after 24 weeks. Reasons for non-adherence to tendon-specific/targeting risk -factor exercises included: lack of time, pain, preferring sports activities, rest day, lack of motivation
Gual 2016[190]	Quantitative RCT	Volleyball/basketball training practice (Spain)	*n* = 53 patients 27 males Age 23.5 Symptoms NR	24-week intervention (eccentric overload) + usual training vs. usual training only (control group)	NA	Type NR Drop-out	Seven participants experienced injuries (2 ankle, 5 knee joint) related to exercises
MacDonald 2019[717]	Quantitative RCT (pilot)	HEP (USA)	*n* = 31 patients 29 males Age 29.3 Symptoms 10.4 months	12-week training programme of eccen-tric squats (standard care) vs. eccentric squats + concentric hip strengthening (treatment)	Adherence Exercise log	NA	Adherence standard care group = 42.5% vs. 50% for eccentric + 62% for hip muscle strengthening in treatment group
Praet 2018[130]	Quantitative RCT (cross-over)	Outpatient sports medicine clinic (Australia)	*n* = 20 patients 13 males Age 44 Symptoms 54 months	24-week calf-strengthening programme + placebo or specific collagen peptide	Adherence Exercise diary	NA	Adherence group 1 (specific collagen pep-tide + exercise) = 84% vs. 78% (placebo)

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Rio 2017[167]	Quantitative Case-series	HEP (Australia)	*n* = 25 patients 19 males	4-week programme of isometric double-leg squat using rigid belt	Adherence Self-report	NA	Median adherence 5 × week (23/25 reported data)
Skovlund 2020[169]	Quantitative Case-series	Department of physical and occupational therapy and institute of sports medicine (Denmark)	*n* = 7 patients 7 males Age 29 Symptoms 12 months	3-week supervised training session (unilateral leg press, knee extension)	Attendance Sessions attended	NA	Training adherence of 98%
Sprague 2021[718]	Quantitative RCT (feasibility pilot)	University health sciences complex (USA)	*n* = 15 patients 10 males Age 26.6 Symptoms 32.2 months	12-weeks pain-guided vs. pain-free modified heavy slow resistance protocol	Adherence Training diary	NA	Exercises completed per day: pain-free group 67.1%, pain-guided group 86.1%; days training diary completed: pain-free group 81.3%, pain-guided group 98.4%
Thijs 2017[621]	Quantitative RCT	Sports medicine department and general hospital (Netherlands)	*n* = 52 patients 38 male Age 28.6 Symptoms 19.5 months	12-week eccentric exercise programme for all participants + ESWT or sham	Adherence Measurement NR	NA	Mean eccentric exercise sessions completed per week: 10.1/14 at 6 weeks and 8.7/14 at 12 weeks for extracorporeal shockwave + exercise group vs. 9.8/14 for sham at 6 weeks and 6.1/14 at 12 weeks
Visnes 2005[129]	Quantitative RCT	HEP (Norway)	*n* = 29 patients 19 males Age 26.5 Symptoms 73.6 months	12-week squat HEP (eccentric) vs. training as usual	Adherence Report	NA	Mean adherence = 8.2 sessions per week out of 14 target sessions (2 × day, overall); mean adherence 63% (overall)
Warden 2008[652]	Quantitative RCT	HEP (Australia)	*n* = 37 patients 30 males Age 27 Symptoms 44 months	12-week daily eccentric exercise programme (active LIPUS + exercise vs. inactive – LIPUS + exercise)	Adherence Log book	NA	Adherence = 60% in active group vs. 65% in inactive

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
van der Worp 2014[640]	Quantitative RCT	Centre for sports medicine and university medical centre (Netherlands)	*n* = 43 patients 32 males Age 31.1 Symptoms 35.2 months	Duration NR. FSWT + eccentric training vs. RSWT + eccentric training	Adherence Online log book	NA	Mean adherence to exercise programme = 3.2/5 for FSWT vs. 3.8/5 for RSWT
Young 2005[132]	Quantitative RCT	HEP (Australia)	*n* = 17 patients 13 males Age 27.3 Symptoms NR	12-week intervention – decline group vs. step group	Adherence Diary	NA	Mean adherence of 72% of total possible sessions (overall, no difference between groups)
Elbow							
Coombes 2013[176]	Quantitative RCT	Clinic and HEP (Australia)	*n* = 165 patients 102 males Age 49.7 Symptoms 3.7 months	Corticosteroid injection vs. injection + physiotherapy vs. placebo injection vs. placebo injection + physiotherapy for 8 weeks. physiotherapy = 8 sessions + HEP (sensorimotor retraining, concentric, eccentric exercises). Duration NR.	Adherence and attendance Measurement NR (adherence), attendance numbers	NA	70% of patients in the physiotherapy groups were compliant with HEP during at least 5 of 7 weeks; mean physiotherapy sessions attended = 7.5/8, 9% (7 patients) completed < 4 sessions
Dale 2015[173]	Quantitative RCT	HEP (USA)	*n* = 17 patients 8 males Age 46.5 Symptoms NR	5-week standard intervention (eccentric + stretch + orthosis) vs. standard + Pilates	Adherence Exercise diary	NA	Most completed HEP 5–6 × week: always (11% standard; 38% standard + Pilates), mostly (73% standard, 50% standard + Pilates), sometimes (11% standard; 0% standard + Pilates), rarely (0% standard; 12% standard + Pilates)

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Luginbuhl 2008[174]	Quantitative RCT	HEP (Switzerland)	*n* = 29 patients 13 male Age 47 Symptoms 10 months	12 weeks forearm support band vs. strengthening exercises (isometric) vs. strengthening + forearm support	Adherence Self-report at follow-up	Tolerability Drop-out reasons	Adherence (strengthening): 67% compliant 3-months, 11% 3 × week only, 11% 2 months only, 11% stopped after 3-weeks due to pain; adherence (strengthening + firearm band): 90% compliant, 10% stopped one of the exercises; tolerability: 1/9 (11%) stopped after 3-weeks due to increased pain (strengthening programme group); 1/9 (11%) stopped exercise with ball reporting ball to be too hard (forearm support + strengthening group)
Park 2010[521]	Quantitative RCT	HEP (Korea)	*n* = 31 patients Sex NR Age 50.15 Symptoms 6.3 months	Immediate physiotherapy vs. delayed physiotherapy (after 4 weeks medication); physiotherapy = isometric resistance exercises. Duration NR.	Adherence Exercise diary (ratio)	NA	3-month compliance = 0.56 (group 1) and 0.75 (group 2); 6 months = 0.43 (group 1) and 0.38 (group 2); 12 months = 52% of participants did not perform the exercises
Peterson 2014[185]	Quantitative RCT	HEP (Sweden)	*n* = 120 patients 63 males Age 47.9 Symptoms 23.5 months	12-week HEP consisting of eccentric or concentric exercise (with weights)	NA	Tolerability and willingness Drop-out reasons	Tolerability: 1/60 (1.7%) dropped out at 1-month as could not perform intervention; willingness: drop-outs due to lack of time at various intervals (*n* = 5)
Söderberg 2012[594]	Quantitative RCT	HEP (Sweden)	*n* = 42 patients 18 males Age 49 Duration of symptoms > 6 months = 26; Duration > 1 year = 20; Duration > 2 years = 11	6-week HEP with eccentric exercises at pain-free intervals	Adherence Self-report	Helpfulness Proportion of patients with tennis elbow	Feasibility: Over 70% compliance for exercise regime and wearing forearm band; Acceptability: proportion of LE cases decreased from 100% to 44%
Vuvan 2020[187]	Quantitative RCT	Clinic and HEP (Australia)	*n* = 40 patients 29 males Age 48.5 Symptoms 4 months	8-week progressive isometric HEP programme and single physiotherapy session vs. wait-and-see	Adherence Exercise diary	Tolerability Pain intensity on NRS; time measure	Feasibility: mean adherence = 87% to exercise programme (diaries obtained from 20/21 in exercise group); acceptability: mean 1.9 (NRS), median 0–60 seconds (length of time for pain to settle after exercise)

continued

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Gluteal/greater trochanteric pain syndrome							
Clifford 2019[179]	Quantitative RCT (pilot)	Physiotherapy clinic and HEP (UK)	*n* = 30 patients 3 male Age 59.3 Symptoms 23 months	12-week daily progressive HEP – isometric vs. isotonic + 8 individual physiotherapy sessions	Attendance, fidelity and adherence NR (attendance), diary (fidelity, adherence)	NA	Attendance: 100% attendance for 8 physiotherapy appointments; fidelity: All but one participant able to progress with loading (isometric group); adherence: 70% completed at least 80% of exercise sessions in isometric group vs. 58% of isotonic
Ganderton 2018[189]	Quantitative RCT	HEP (Australia)	*n* = 94 patients 94 Female Age 61.8 Symptoms NR	12-week exercise programme (GLoBE – isometric loading, kinetic chain, strengthening) vs. sham	Adherence Diary	Tolerability Adverse events	Feasibility: 75.8% (mean) adherence for GLoBE vs. 75.99% sham; acceptability: 1/94 (1.1%) participants reported increased pain attributed to exercises; completed intervention and follow-up outcomes
Mellor 2018[30]	Quantitative RCT	Clinic and HEP (Australia)	*n* = 204 participants 37 males Age 54.8 Symptoms 24 months	8-week programme education + HEP (strengthening) vs. corticosteroid injection vs. wait-and-see	Adherence Exercise diary	NA	Overall programme adherence mean of 88% of prescribed exercises completed
Stephens 2020[160]	Qualitative Qualitative descriptive	NHS elective orthopaedic hospital (UK)	*n* = 10 patients 1 male Age 62.4 Symptoms 23.6 months	To understand experiences of GTPS	Experiences and perceptions of individuals with a primary complaint of GTPS Semi-structured telephone interviews		Themes: (i) living with persistent pain; (ii) understanding the problem and pain; (iii) experiences of previous treatment; (iv) beliefs about activity and exercise; (v) the future
Hamstring							
Silder 2013[690]	Quantitative RCT	HEP (USA)	*n* = 24 patients 19 males Age 24 Symptoms NR	Duration NR. Progressive running and eccentric training vs. progressive agility + trunk stabilisation. Both 5 days per week	Adherence Exercise log	NA	Adherence = 88% in progressive running group vs. 80% in progressive agility group

TABLE 66 Studies included in mixed-methods review: characteristics and results (*continued*)

First author year	Methodology design	Setting	Participants (number (*n*); sex (*n*); mean age; mean symptom duration)	Intervention (quantitative) Intervention or focus of study (qualitative)	Feasibility (types; measures/tools)	Acceptability (types; measures/tools)	Results
Iliopsoas syndrome							
Johnston 1999[168]	Quantitative Retrospective case series	HEP (Canada)	*n* = 9 patients Age 35.6 1 male Symptoms 12.6 months	Duration NR. Hip rotation rehabilitation programme	Adherence Telephone interview	Helpfulness and tolerability Telephone interview	Feasibility: mean compliance = 2 (moderately compliant); acceptability (tolerability): all exercises caused hip pain, especially quadricep stretch; acceptability (helpfulness): 3/9 (33%) stated exercises with band most beneficial; 2/9 (22%) stated stretching and strengthening most effective in combination; 2/9 (22%) stated stretches most useful; 1/9 (11%) reported the exercises caused pain
PTTD							
Campbell 2019[151]	Qualitative Interpretative phenomeno-logical analysis	Private podiatry clinic (USA)	*n* = 5 patients 2 males Age 60.2 Symptoms 12.4 months	Treatment for PTTD	Lived experience of undergoing treatment for PTTD Semi-structured interviews		Superordinate themes: (i) adverse experience during the patient journey; (ii) treatment burden, (iii) negative self-concept
Mixed tendinopathy							
Jayaseelan 2019[148]	Quantitative Case report	HEP (USA)	*n* = 3 patients 2 males Age 35.6 Symptom duration 29.3	8-week tailored exercise programme (joint mobilisation, self-stretching, PNE, aerobic exercise)	Adherence Exercise log	NA	100% adherence
Levy 2009[150]	Qualitative Interpretative phenomeno-logical analysis	Private physiotherapy clinic (UK)	*n* = 6 patients 4 males Age (range) 24–38 Symptoms NR	Sport injury rehabilitation	Recreational athletes' experiences and perceptions of adhering to a sport injury rehabilitation programme Semi-structured interviews		Themes: (i) motivation; (ii) confidence; (iii) coping; (iv) social support; (v) pain

*denotes 2 reports from same study – pilot RCT and qualitative paper
**denotes 2 reports from the same study – RCT and qualitative paper.

Appendix 8 Quality appraisal results mixed-method review

TABLE 67 Checklist for RCTs (n = 68)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	Score
Agergaard *et al.* (2021)[180]	Y	U	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	10
Bahr *et al.* (2006)[131]	Y	Y	Y	N	N	N	Y	U	Y	Y	Y	Y	Y	9
Bateman and Adams (2014)[248]	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	9
Bell *et al.* (2013)[251]	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Bennell *et al.* (2010)[188]	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Beyer *et al.* (2015)[18]	Y	U	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	10
Boesen *et al.* (2017)[162]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13
Boesen *et al.* (2019)[163]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13
Boudreau *et al.* (2019)[262]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Breda *et al.* (2020)[696]	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	12
Clifford *et al.* (2019)[179]	Y	Y	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	9
Conroy and Hayes (1998)[298]	U	U	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	10
Cook *et al.* (2014)[172]	Y	U	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	10
Coombes *et al.* (2013)[176]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Dale *et al.* (2015)[173]	U	U	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	8
de Oliveira *et al.* (2020)[703]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
de Vos *et al.* (2007)[59]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
de Vos *et al.* (2010)[314]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13

continued

TABLE 67 Checklist for RCTs (n = 68) (*continued*)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	Score
Dejaco *et al.* (2017)[44]	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	11
Dupuis *et al.* (2018)[339]	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	10
Flores *et al.* (2017)[183]	Y	U	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	10
Fournier Belley *et al.* (2018)[164]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13
Ganderton *et al.* (2018)[189]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Granviken and Vasseljen (2015)[374]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Gual *et al.* (2016)[190]	Y	U	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	9
Heron *et al.* (2017)[390]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Herrington and McCulloch (2007)[391]	U	U	Y	N	N	Y	Y	Y	y	Y	Y	Y	Y	9
Holmgren *et al.* (2012)[393]	Y	Y	N	Y	N	Y	Y	Y	U	Y	Y	Y	Y	10
Horstmann *et al.* (2013)[16]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Ingwersen *et al.* (2017)[191]	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12
Jonsson and Alfredson (2005)[186]	U	U	Y	U	U	U	Y	Y	Y	Y	Y	Y	Y	8
Juul-Kristensen *et al.* (2019)[412]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Knobloch *et al.* (2007)[192]	U	U	N	N	N	Y	Y	U	U	Y	Y	Y	Y	6
Kromer *et al.* (2013)[443]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Kvalvaag *et al.* (2018)[450]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Littlewood *et al.* (2014)[460]	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	9
Littlewood *et al.* (2016)[34]	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	10
Luginbuhl *et al.* (2008)[174]	Y	U	U	N	N	U	Y	U	U	Y	Y	Y	Y	6

TABLE 67 Checklist for RCTs (n = 68) (*continued*)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	Score
MacDonald *et al.* (2019)[717]	Y	Y	Y	N	N	U	Y	Y	U	Y	Y	Y	Y	9
Malliaras *et al.* (2020)[715]	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	10
Mellor *et al.* (2018)[30]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Morrissey *et al.* (2011)[716]	Y	Y	N	N	N	U	Y	Y	U	Y	Y	Y	Y	8
Munteanu *et al.* (2015)[490]	Y	Y	Y	Y	N	U	Y	Y	Y	Y	Y	Y	Y	11
Park *et al.* (2010)[521]	Y	U	Y	N	N	U	Y	Y	U	Y	Y	Y	Y	8
Peterson *et al.* (2014)[185]	Y	U	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	8
Praet *et al.* (2018)[130]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13
Rabusin *et al.* (2020)[686]	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	11
Roddy *et al.* (2021)[109]	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Rompe *et al.* (2008)[687]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Roos *et al.* (2004)[193]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Söderberg *et al.* (2012)[594]	Y	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	10
Silder *et al.* (2013)[690]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Solomons *et al.* (2020)[595]	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Sprague *et al.* (2021)[718]	y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	8
Stefansson *et al.* (2021)[184]	Y	U	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	10
Stevens and Tan (2014)[175]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Thijs *et al.* (2017)[621]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Tumilty *et al.* (2012)[630]	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	12
Tumilty *et al.* (2016)[632]	Y	Y	Y	Y	U	Y	Y	Y	Y	Y	Y	Y	Y	12

continued

TABLE 67 Checklist for RCTs (*n* = 68) (*continued*)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	Score
Turgut *et al.* (2017)[633]	Y	U	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	9
van der Vlist *et al.* (2020)[646]	Y	U	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	11
van der Worp *et al.* (2014)[640]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Visnes *et al.* (2005)[129]	Y	U	Y	N	N	U	Y	Y	Y	Y	Y	Y	Y	9
Vuvan *et al.* (2020)[187]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	11
Walther *et al.* (2004)[161]	U	U	Y	N	N	U	Y	U	U	Y	Y	U	Y	5
Warden *et al.* (2008)[652]	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	12
Yelland *et al.* (2011)[674]	Y	U	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	9
Young *et al.* (2005)[132]	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	10

Note
Y, yes; N, no; U, unclear. Question 1: Was true randomisation used for assignment of participants to treatment groups?; Question 2: Was allocation to treatment groups concealed?; Question 3: Were treatment groups similar at the baseline?; Question 4: Were participants blind to treatment assignment?; Question 5: Were those delivering treatment blind to treatment assignment?; Question 6: Were outcomes assessors blind to treatment assignment?; Question 7: Were treatment groups treated identically other than the intervention of interest?; Question 8: Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?; Question 9: Were participants analysed in the groups to which they were randomised?; Question 10: Were outcomes measured in the same way for treatment groups?; Question 11: Were outcomes measured in a reliable way?; Question 12: Was appropriate statistical analysis used?; Question 13: Was the trial design appropriate, and any deviations from the standard RCT design (in dividual randomisation, parallel groups) accounted for in the conduct and analysis of the trial?

TABLE 68 Checklist for quasi-experimental studies (*n* = 10)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	Score
Ferrer *et al.* (2018)[177]	Y	Y	Y	N	Y	Y	Y	Y	Y	8
de Jonge *et al.* (2015)[308]	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Knobloch *et al.* (2010)[182]	Y	Y	Y	N	Y	Y	Y	Y	Y	8
Mantovani *et al.* (2020)[181]	Y	NA	NA	N	Y	Y	NA	Y	Y	5/6
Ram *et al.* (2013)[546]	Y	NA	NA	N	Y	Y	NA	Y	Y	5/6

TABLE 68 Checklist for quasi-experimental studies (n = 10) (*continued*)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	Score
Sancho *et al.* (2019)[178]	Y	Y	Y	N	Y	Y	Y	Y	Y	8
Kim *et al.* (2019)[432]	Y	N	Y	Y	Y	Y	Y	Y	Y	8
Turgut *et al.* (2018)[634]	Y	NA	NA	N	Y	Y	NA	Y	Y	5/6
Verrall *et al.* (2011)[149]	Y	Y	Y	N	Y	Y	Y	Y	Y	8
Wetke *et al.* (2015)[660]	Y	NA	NA	N	Y	U	Y	Y	Y	5/6

Note
Y, yes; N, no; U, unclear; NA, not applicable. Question 1: Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?; Question 2: Were the participants included in any comparisons similar?; Question 3: Were the participants included in any comparisons receiving similar treatment, other than the exposure or intervention of interest?; Question 4: Was there a control group?; Question 5: Were there multiple measurements of the outcome both pre and post the intervention/exposure?; Question 6: Was follow-up complete and, if not, were differences between groups in terms of their follow up adequately described and analysed?; Question 7: Were the outcomes of participants included in any comparisons measured in the same way?; Question 8: Were outcomes measured in a reliable way?; Question 9: Was appropriate statistical analysis used?

TABLE 69 Checklist for case-control studies (n = 2)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	10	Score
Masood *et al.* (2014)[166]	Y	Y	Y	Y	Y	NA	NA	Y	Y	Y	8/8
Seitz *et al.* (2019)[165]	Y	N	Y	Y	Y	NA	NA	Y	Y	Y	7/8

Note
Y, yes; N, no; U, unclear; NA, not applicable. Question 1: Were the groups comparable other than the presence of disease in cases or the absence of disease in controls?; Question 2: Were cases and controls matched appropriately?; Question 3: Were the same criteria used for identification of cases and controls?; Question 4: Was exposure measured in a standard, valid and reliable way?; Question 5: Was exposure measured in the same way for cases and controls?; Question 6: Were confounding factors identified?; Question 7: Were strategies to deal with confounding factors stated?; Question 8: Were outcomes assessed in a standard, valid and reliable way for cases and controls?; Question 9: Was the exposure period of interest long enough to be meaningful?; Question 10: Was appropriate statistical analysis used?

TABLE 70 Checklist for case series (*n* = 4)

Question: Author (Year)	1	2	3	4	5	6	7	8	9	10	Score
Johnston *et al.* (1999)[168]	Y	Y	Y	U	N	Y	Y	Y	Y	Y	8
Rio *et al.* (2019)	Y	Y	Y	U	U	N	Y	Y	N	Y	6
Skovlund *et al.* (2020)[169]	Y	Y	Y	U	U	Y	Y	Y	Y	Y	8
van Ark *et al.* (2013)[170]	Y	Y	Y	U	U	Y	Y	Y	Y	Y	8

Note
Y, yes; N, no; U, unclear. Question 1: Were there clear criteria for inclusion in the case series?; Question 2: Was the condition measured in a standard, reliable way for all participants included in the case series?; Question 3: Were valid methods used for identification of the condition for all participants included in the case series?; Question 4: Did the case series have consecutive inclusion of participants?; Question 5: Did the case series have complete inclusion of participants?; Question 6: Was there clear reporting of the demographics of the participants in the study?; Question 7: Was there clear reporting of clinical information of the participants?; Question 8: Were the outcomes or follow-up results of cases clearly reported?; Question 9: Was there clear reporting of the presenting site(s)/clinic(s) demographic information?; Question 10: Was statistical analysis appropriate?

TABLE 71 Checklist for case reports (*n* = 1)

Question: Author (Year)	1	2	3	4	5	6	7	8	Score
Jayaseelan *et al.* (2019)[148]	Y	Y	Y	Y	Y	Y	N	Y	7

Note
Y, yes; N, no. Question 1: Were patient's demographic characteristics clearly described?; Question 2: Was the patient's history clearly described and presented as a timeline?; Question 3: Was the current clinical condition of the patient on presentation clearly described?; Question 4: Were diagnostic tests or assessment methods and the results clearly described?; Question 5: Was the intervention(s) or treatment procedure(s) clearly described?; Question 6: Was the post-intervention clinical condition clearly described?; Question 7: Were adverse events (harms) or unanticipated events identified and described?; Question 8: Does the case report provide takeaway lessons?

TABLE 72 Checklist for qualitative research (*n* = 11)

Question: Author (year)	1	2	3	4	5	6	7	8	9	10	Score
Barrett *et al.* (2018)[154]	U	U	U	U	U	N	Y	Y	Y	U	3
Campbell *et al.* (2019)[151]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10
Hanratty *et al.* (2016)[155]	U	U	U	U	U	Y	Y	Y	Y	Y	5
Hasani *et al.* (2021)[152]	U	Y	Y	Y	Y	N	Y	Y	Y	Y	8
Levy *et al.* (2009)[150]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10
Littlewood *et al.* (2014)[156]	U	U	U	U	U	U	Y	Y	Y	Y	4

TABLE 72 Checklist for qualitative research (n = 11) (*continued*)

Question: Author (year)	1	2	3	4	5	6	7	8	9	10	Score
Littlewood *et al.* (2015)[107]	Y	Y	Y	Y	Y	Y	U	Y	Y	Y	9
Mc Aulife *et al.* (2017)[153]	Y	Y	Y	Y	Y	U	N	Y	Y	Y	8
Sandford *et al.* (2017)[157]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10
Stephens *et al.* (2020)[160]	U	U	U	U	U	Y	Y	Y	Y	Y	5
White *et al.* (2020)[159]	U	U	U	U	U	N	N	Y	Y	Y	3

Note
Y, yes; N, no; U, unclear. Question 1: Is there congruity between the stated philosophical perspective and the research methodology?; Question 2: Is there congruity between the research methodology and the research question or objectives?; Question 3: Is there congruity between the research methodology and the methods used to collect data?; Question 4: Is there congruity between the research methodology and the representation and analysis of data?; Question 5: Is there congruity between the research methodology and the interpretation of results?; Question 6: Is there a statement locating the researcher culturally or theoretically?; Question 7: Is the influence of the researcher on the research, and vice versa, addressed?; Question 8: Are participants, and their voices, adequately represented?; Question 9: Is the research ethical according to current criteria or, for recent studies, is there evidence of ethical approval by an appropriate body?; Question 10: Do the conclusions drawn in the research report f low from the analysis, or interpretation, of the data?

Appendix 9 Findings and illustrations extracted from qualitative studies

TABLE 73 Findings and illustrations extracted from qualitative studies

Study: Barrett *et al.* 2018[154]	
Finding	Support, motivation, and learning from peers (U)
Illustration	You're better off to do it in a group … you'd be more determined to do it … you don't put the whole 100% effort in at home. (Ben) (p. 467)
Finding	Preference for exercise class compared to individual shoulder physiotherapy (U)
Illustration	The repetitiousness of the class does stay in your mind rather than just going once a month to physio and you're supposed to be doing all these exercises and so on you know. (Sandra) (p. 467)
Finding	The physiotherapist as an educator and facilitator (U)
Illustration	In the earlier part they really babysat me and nursed me along and when I got to the point when I was doing the exercises myself … they just observed what was going on … they encouraged me to start swimming. (Mark) (p. 468)
Finding	Beliefs about pain and exercise (C)
Illustration	Still every day I do my exercises and I find that when I feel the pain coming on in my arm I have a walking stick and I just do exercises with that, I haven't taken pain killers in I don't know how long, I am good with pain now. (Margaret) (p. 468)
Study: Mc Aulife *et al.* 2017[153]	
Finding	However, in contrast participants also discussed their disbelief and lack of confidence in relation to a proposed exercise intervention (C)
Illustration	But i know there are some exercises you should be doing and things like but that. I probably haven't done as much strength work. I don't go to the gym. I don't do any strength work or anything like that. (Participant 1) (p. 110)
Finding	Participants also highlighted the expected role of exercise interventions in the management of their AT (C)
Illustration	There was a therapy that was recommended to me maybe at the start of the year, it was called heel drops or painful heel drops? They're on the edge of the steps and you basically flex, you basically flex down and flex up …. Was it 10 minutes a night every night for 12 weeks but in my head that was crazy. (Participant 5) (p. 111)
Study: Campbell *et al.* 2019[151]	
Finding	Most of the participants in this cohort experienced some form of treatment burden/fatigue with respect to the prescribed exercises and orthoses. This had psychological consequences when the orthoses or exercises were not having a positive effect in reducing pain or improving function (U)
Illustration	I felt awful, yeah I mean I was doing them (exercises) it was painful, and I was quite regimented, I was like I've got to do the physio because I've got to make it better … it had been going on a really long time it was just getting worse. (Mila) (p. 6)
Study: Levy *et al.* 2009[150]	
Finding	Motivation (U)
Illustration	Knowing I would be out of action for three to four months was enough motivation to make me want to stick to my rehabilitation programme. My motivation was born out of the fact that I was terribly frustrated with not only being unable to compete, but also missing out on the social side. Simple things like having a drink after the game and partaking in organised social events were things I really enjoyed. (Max) (p. 218)
Finding	Confidence (U)

continued

TABLE 73 Findings and illustrations extracted from qualitative studies (*continued*)

Illustration	Although all the prescribed exercises were new to me, I felt confident performing them in the rehabilitation centre because I knew I was being monitored by the physio; however, I felt much less confident performing exercises at home by myself. … I wasn't entirely sure I was doing the exercises correctly and, as such, I didn't want to further injure myself, having this concern made it difficult for me to comply with home-based exercises. (Carol) (p. 218)
Finding	Coping (U)
Illustration	Performing the rehab exercises can be demanding physically and emotionally. … So to have found a physio who was very supportive was very comforting and reassuring. The physio provided good guidance and frequent feedback about how well I was doing; he seemed to have a lot of time for me in the clinic and had taken a keen interest …. This made me feel valued. He wanted me to get better and this came across well. It is because of this that I didn't want to let him [the physio] down. (Carol) (p. 220)
Finding	Social support (U)
Illustration	Oh, the support I got from my family and friends was great. My husband has been fantastic watching over me making sure I don't do anything I shouldn't. My best friend sometimes came to the rehab centre with me which I really appreciated. (Carol) (p. 221)
Finding	Pain (U)
Illustration	Pain was something I was concerned about during rehab, because sometimes doing the prescribed exercises was painful, which put doubt in my mind if I should be doing them or not. I suppose some pain is normal in order to get better but I think it is difficult to know the difference between pain that is acceptable and pain that is bad. (p. 222)
Study: Stephens *et al*. 2020[160]	
Finding	Lack of success with physiotherapy was attributed to many reasons, including lack of belief about the effectiveness, lack of compliance with treatment and the pain caused by exercise (U)
Illustration	I think I had about three different ones (physiotherapists) … and they were also the ones who did the hydrotherapy and acupuncture as well … but the exercises were just putting me in pain, so it didn't help. (P10) (p.4)
Finding	Most participants remained positive about the potential of exercise therapy to improve their condition and were even happy to tolerate discomfort during it (8/10). This was often caveated with the associated desire to understand when symptoms indicated that exercise was detrimental. (U)
Illustration	Oh, good Lord yeah. Anything that would help I'd go for … If they told me that it would help [exercise with discomfort], I would do it. [When asked what information would be useful] Would it be detrimental if I pushed myself that little bit further?' (P8) (p. 5)
Finding	However, not all participants (2/10) would find some discomfort with exercise acceptable, as pain elicited during exercise lingered significantly in some cases. (U)
Illustration	I wouldn't do it (put up with discomfort during exercise). And that is purely because if it affects my day to day living … it's just not worth it. (P6) (p. 5)
Study: Hasani *et al.*[152]	
Finding	All participants (8/8) expressed satisfaction with the quality of service they received via telehealth mainly because it was perceived to be efficient. (C)
Illustration	I did not have to go and wait in an office or whatever. I could just go to the gym and just get started and if he was not ready or whatever then I could just get into my workout and he [physiotherapist] would join me halfway through sometimes. There was no waiting around.' (P4) (p. 4)
Finding	All participants (8/8) found progressive loading exercises to be an effective form of treatment compared to their experience of previous treatment approaches. (U)
Illustration	The idea that it is more about of putting it [Achilles tendon] under load for longer has been a lot more effective than all the stretching, warming and icing and everything else that I have tried before. (P8) (p. 4)
Finding	Usability of the software: nearly all participants (7/8) reported that the telehealth software was easy to use. (U)
Illustration	The physio would send me a link; I would click on the link on my phone and away [we] go. It was pretty effortless. (P5) (p. 4)

TABLE 73 Findings and illustrations extracted from qualitative studies (*continued*)

Finding	Flexibility in arranging an appointment time. The flexibility and convenience of telehealth allowed participants to schedule treatment/exercise within convenient times that avoided peak gym-use times. (U)
Illustration	Because I am a shift worker and I had really odd hours, it made access to the gym at times pretty good because there was nobody else there. (P1) (p. 4)
Finding	Therapeutic alliance: all participants (8/8) acknowledged that despite not being face-to-face with their physiotherapist, they still felt reassured by the telehealth contact with their physiotherapist, especially in the early stages when they were gaining familiarity and confidence with the treatment process. (U)
Illustration	She [physiotherapist] was patient and did not treat me like an idiot when I did not know what I was doing in the beginning and things like that .... She talked me through it [exercise set-up] well and all that, made it easy to understand. She let me know what I was doing at every stage. (P2) (p. 4)
Finding	All participants (8/8) reported that telehealth was motivating and promoted commitment to their exercise programme. (U)
Illustration	The audio feedback and them [physiotherapists] telling you to go longer, faster, shorter, harder, whatever their instruction happens to be, that is sort of invaluable. (P3) (p. 5)
Finding	Several participants (4/8) complained about poor or no Wi-Fi at their gym. There were reservations about having to use their personal phone internet data for the videoconference call. On several occasions, participants reported they were running out of phone battery, which impacted the length of the session. (U)
Illustration	It was the longer regimen that I was on [low-intensity group]. A couple of times my battery went out and I was using up all my data because it was an hour and a half session. (P8) (p. 6)
Finding	For a few participants (2/8), assistance was needed to set up the correct camera angle of their phone while they were training on the Smith machine. (U)
Illustration	‘It was more the Smith machine’s limitations in regard to getting the right height for the phone. (P7) (p. 5)
Finding	Regular contact: participants appreciated the ability to have regular contact with a physiotherapist for support and obtain immediate feedback to allow them to progress their exercises. (U)
Illustration	I think if you did not have to talk to anybody, you might get lazy some days and not bother. Whereas that sort of kept you committed and making sure you will not forget your exercises. (P6) (p. 7)
Finding	The nature of the exercise: several participants (5/8) appreciated the simplicity (i.e. two calf-raise exercises) and how clearly they were explained as part of the trial intervention. (U)
Illustration	‘It was simple and easy to do and straight forward. (P4) (p. 7)
Finding	Accessibility to the gym: several participants (5/8) accessed a 24-h gym in a convenient location which reportedly assisted with adherence and motivation. (U)
Illustration	Access to the 24-hour gym was handy for me, because I work in different hours and have got family and young kids, so it’s quite good that I could go at any time I wanted ... and having the various gyms and having access to those around the place definitely helped me, because like I said, I travel a fair bit for work, so that was very handy. (P7) (p. 7)
Finding	Self-management education: all participants (8/8) noted that the one-to-one self-management education they received at the start of the rehabilitation programme was helpful and changed the way they perceive their Achilles symptoms. Specifically, the education improved their self-efficacy and ability to understand acceptable pain limits during activity. (U)
Illustration	Having a little bit of pain does not mean to say that you should not be doing the exercises. So as long as it is not getting really bad, that guidance on how to manage the pain aspect of it, now that I am thinking about it, was very handy because it gives you framework to decide well is this normal aches and pains or is it something a bit more serious. (P5) (p. 7)
Finding	Ability to see progress: all participants (8/8) described the care provided as effective in terms of improvement in symptoms and function. Being able to observe progress and experience less pain was reportedly a key motivator. (U)
Illustration	I do not have the pain that I used to. I was getting to the stage at times I was quite immobile at work. But I have not had that ever since the programme inished ... which is great. (P1) (p. 7)

continued

TABLE 73 Findings and illustrations extracted from qualitative studies (*continued*)

Finding	Time: making time to commit to regular exercise was reported as a barrier by several participants (6/8). This was commonly because of competing commitments e.g. employment or caregiving. (U)
Illustration	It was so time-consuming … I did not have much time to do anything else in the gym. (P5) (p. 7)
Finding	Exercise: several participants (5/8) expressed a feeling of leg discomfort from the pressure of the Smith bar on their thigh during their seated calf-raises. (U)
Illustration	It was suggested that I use like a foam mat or something, but I was up to about 100 odd kilos, it was quite painful to have the bar on. (P5) (p. 7)
Finding	Physiotherapists reflected on the accessibility and convenience of telehealth. Further, physiotherapists felt telehealth enabled more regular contact with participants. (U)
Illustration	I found that close contact especially with quite anxious type [participants], just being able to reassure them that where their early stages were absolutely fine and appropriate and to be expected, I think that helped them stick to the course. (PT 4) (p. 8)
Finding	Physiotherapists proposed that more encouragement and motivation was needed for participants requiring longer time to complete their sessions (i.e. participants in low-intensity groups who completed 18 repetitions per set rather than six). One of the proposed strategies was a follow-up email post-session. (U)
Illustration	I think other people who got irritated around time at the gym they definitely did longer session … I liked the follow-up emails after the session, sort of template kind of idea of what you could send them [to participants] at some point positive things from their session encouraging them for the next week. (PT3) (p. 8)
Finding	Technology-related: physiotherapists noted multiple technology-related issues during the telehealth sessions, including poor videoconference quality or loss of video conference connection, insufficient participant phone battery life and inability to operate the videoconference video function. Some sessions had to be discontinued due to technology-related issues. (U)
Illustration	Sometimes technical issues and connectivity sort of problems … a couple of times participants have forgot to recharge their phone properly and phone might have sort of drained out. (PT5) (p. 8)
Finding	A few physiotherapists discussed the limitations of only having one camera angle to view participants and assist with providing feedback related to calf-exercise fidelity. In some cases, physiotherapists experimented with camera angles to improve visualisation. (U)
Illustration	I am not entirely sure of how easy that is [telehealth] to correct technique rather than being there in person to observe that in more detail we see from different angles and adjust things as you are going so. (PT1) (p. 9)
Finding	Therapeutic alliance: although physiotherapists reported that the use of telehealth was an effective method for therapeutic interactions, they also reported some barriers to developing a therapeutic alliance. (U)
Illustration	I was probably a little slower to develop the relationship, so I found a couple of sessions to sort of warm up and get a bit more hold over messages. (PT1) (p. 9)
Finding	Gym-based exercise: physiotherapists reported some challenges accessing the Smith machine for some of their participants especially when the local gym had limited equipment (e.g. only one Smith machine). In some cases sessions had to be rescheduled due to long waiting times. (U)
Illustration	I think most people have that gym etiquette that someone is using [the machine] then leave them alone and then just keep the workout or do something else, but couple of times I have had to cancel a session because patients could not access the Smith machine for like half an hour or 40 minutes. (PT5) (p.9)
Study: Sandford *et al.* 2017[157]	
Finding	The importance placed on being able to manage their own condition through improved knowledge and a feeling of increased control was highlighted as a recurrent theme within the participants' transcripts. (U)
Illustration	I've been through a series of classes and I've seen the benefits. I've just come to the realisation that it is something that I just have to manage and by doing the exercises I feel I can manage it. Exercise is key for me. (P75) (p. 196)
Finding	This illustrates and emphasises the need to find strategies to educate patients regarding expected rehabilitation and recovery times to ensure that their expectations are realistic. (U)

TABLE 73 Findings and illustrations extracted from qualitative studies (*continued*)

Illustration	At first I expected to see an improvement within a few weeks but it was so small. They tried to encourage me saying it was a long haul and by the end they said it would be six to nine months. I think it might have helped to know the six-to-nine-month time frame at the beginning. (P62) (p. 196)
Finding	The exercise group was cited as being good fun and helpful by several participants. (U)
Illustration	The group aspect was good; it was really fun. I enjoyed doing the exercises every Thursday morning, it was one hour's really fun and that really helped me a lot. (P56) (p. 196)
Study: Hanratty *et al.* 2016[155]	
Finding	Need for patient education (C)
Illustration	So, you're putting the onus back on them [the patient] to be proactive ... to allow the patient to self-manage, that exercise is the key. (PT05) (p. 1358)
Finding	Achieving patient education (U)
Illustration	I started videoing exercises that patients are doing on their phone .... It's a lot quicker than writing down and using PhysioTools [a computer programme that produces exercise diagrams]. (PT06) (p. 1359)
Study: Littlewood *et al.* 2015[107]	
Finding	Prescription of the self-managed loaded exercise programme was a challenge in terms of what might be regarded as the simplistic and restricted nature of the intervention. (C)
Illustration	If it was self-management I always wanted to do extra things that I could identify there and then and that was quite hard for me to take a step back. (P8) (p. 281)
Finding	For others with greater experience it was apparent that their existing belief system served to facilitate for some, but challenge for most, the rationale underpinning the self managed loaded exercise programme. (U)
Illustration	To give one exercise ... it was more I had a bit of an issue with that more than the patient did to start with. (P11) (p. 281)
Finding	The physiotherapists recognised the importance of knowledge translation and the need to 'sell' the self-managed exercise intervention; both of which were underpinned by the need to develop a therapeutic relationship. (U)
Illustration	It's that trust thing ... if you give it confidently enough they believe you. (P1) (p. 281)
Finding	Most of the physiotherapists appreciated the simplicity, particularly from the perspective of the patient, in terms of improving communication and exercise adherence. (U)
Illustration	It's been a lot simpler treating the self-management group; keeping the exercise regime simpler, the patients have understood it more, erm the conversation between therapist and patient has been clearer. (P11) (p. 282)
Finding	This simplicity was not appreciated by all and the physiotherapists considered this from their own perspective and that of the patient. (U)
Illustration	For my patients, they certainly found it slightly different, especially those that had experienced private physio before, erm they said oh, is that it? They were, well are you not doing anything else? Is it just one exercise? Is that it? (P8) (p. 282)
Finding	Discussion around this factor generated a broad range of responses from those who were very comfortable with the notion, those who were very uncomfortable and those who might be regarded as taking more of a middle ground. (U)
Illustration	In terms of the training it was always saying, taught that you don't want to push in to pain that you don't, you might get associated inhibition and sort of, of the muscles alongside it so, so different from that point of view. But then, like you said, if you have a look at it from the eccentric loading perspective then we do ask people to, to go in to pain when they're exercising so erm I could see how it might fit. (P7) (p. 282)
Finding	The physiotherapists felt that most of the patients took longer to achieve a worthwhile clinical outcome than might be expected using other means of treatment. (U)
Illustration	The only slight barrier was more of the slightly slow progress. (P13) (p. 283)

continued

TABLE 73 Findings and illustrations extracted from qualitative studies (*continued*)

Study: Littlewood *et al.* 2014[156]	
Finding	Additionally, the patients described the role of the physiotherapist, which, in some situations, seemed to compound the negative nature of their prior beliefs. (C)
Illustration	Well I think [physiotherapist] felt more or less straight away that it was unfortunate that I'd drawn the short straw in terms of that. (ID37) (p. 82)
Finding	This narrative from the patient perspective was in concordance with opinion expressed by one of the physiotherapists, where it can be seen that prior beliefs might impact upon their role in this environment. (C)
Illustration	I think there are some clients who from interviewing them, doing the examination, that you get an idea of whether they would be compliant and appropriate, and others you just think it's totally inappropriate and a waste of time. (T1) (p. 82)
Finding	A key barrier to ongoing engagement appeared to be a lack of an early and appreciable response to the therapy. (U)
Illustration	I think that when you find that they're not making a great deal of improvement, you're less inclined to erm continue it. (ID37) (p. 82)
Finding	When the symptoms improved to a certain point, although not resolved, the impetus to continue was also challenged. (C)
Illustration	I would continue if it was still badly hurting. (ID13) (p. 82)
Finding	Following some early reported benefit from the exercise programme, one patient indicated subsequent difficulty as the symptoms failed to respond as the programme progressed. Despite this, they did not consider regressing the programme or seeking advice, indicating an external locus of control as a potential barrier. (C)
Illustration	I just followed whatever the next one was … I just kept thinking I'll be glad when I go back and I might have something to do a bit easier or something. (ID17) (p. 82)
Finding	Some patients still expressed concern about attributes of the intervention. (C)
Illustration	At first it seemed like a big task to do, because it was an additional thing to do through the day. (ID18) (p. 82)
Finding	Disquiet was expressed about the simplicity of the intervention and hence its lack of potential effectiveness. (U)
Illustration	To cap it all it's such a simple exercise … I just came out thinking waste of time. (ID29) (p. 82)
Finding	The influence of the physiotherapist was framed in a more positive way (U)
Illustration	She explained it very well and said what the aim was and that if it did hurt what to do … I could ring her if I had problems, and she was very responsive, she rang me back the same day and said what to do … I felt very comfortable, very confident. (ID18) (p. 83)
Finding	One patient recognised the role of their partner in providing feedback and stimulating further engagement with the self-managed exercise programme during times when progress was slow. (C)
Illustration	My (partner) erm kept saying to me that (they) thought that I was complaining a lot less as time went on. I didn't feel that but she assured me that I was. (ID15) (p. 83)
Finding	Patients also described personal traits that indicated self-efficacious individuals who took control of the programme. (U)
Illustration	I kept my diary and I always wrote why I'd not done it so that I could think to myself well how can I fit that in then? (ID18) (p. 83)
Finding	Other personal attributes were also described. (U)
Illustration	I was driven to get rid of this pain really, so I thought I'm going to give this a really good go and do it properly. (ID18) (p. 83)
Finding	Physiotherapists felt able to identify patients who they expected would successfully engage with the self-managed exercise programme. (U)

TABLE 73 Findings and illustrations extracted from qualitative studies (*continued*)

Illustration	I think it's a certain type of person where you're going to be able to have success with a regime of exercises and no hands-on, I would say .... People who were very positive about life ... they were usually quite outgoing, quite confident in themselves and quite determined. (T1) (p. 83)
Finding	One patient reflected upon a previous episode of physiotherapy when engagement with a prescribed exercise programme was limited. (C)
Illustration	I didn't do them ... I don't know – because I thought they were doing it for me. So I came back with the booklet but I didn't do them. I thought oh well, I'm going back next week. (ID18) (p. 83)
Finding	Whereas some patients had found aspects of the intervention difficult to implement, those patients who reported a successful outcome detailed different experiences. (U)
Illustration	With it being such an easy exercise it ... became part of a routine ... I would do, it was short, short and sweet. So it wasn't a case of having to find time to do it, it just naturally fell into a little sort of routine that I have. (ID29) (p. 83)
Finding	With reference to the exercise diary which is used as a key component of the programme as a means of self-monitoring, one patient reflected: (C)
Illustration	I stuck the sheet that I was given on the fridge so it was there in the kitchen to remind me every day. (ID29) (p. 83)
Finding	Additionally, with regard to the proactive follow-up by the physiotherapist, another patient recognised: (U)
Illustration	I knew I was seeing (physiotherapist) on those regular appointments; it was every four weeks wasn't it? So because I knew I was seeing her, I didn't want to go to her and say I've not done it. So that was a motivator to me. (ID18) (p. 83)
Finding	Patients experienced a favourable therapeutic response that persuaded them of the potential value of the programme to them. (U)
Illustration	When I started seeing the results ... I was so pleased with it that that motivated me on more and more to keep going. (ID18) (p. 83)
Study: White *et al.* 2020[159]	
Finding	The need for early, focussed education: 'some beliefs can be detrimental to rehabilitation options'. (U)
Illustration	It's about trying to reduce anxiety through education or reassurance and to reduce any hypervigilance, which actually may affect their outcome ... and ultimately affect their adherence to any exercise intervention. (P1, PT) (p. 3)
Finding	Patient-centred care promotes development of a therapeutic alliance: 'If a patient trusts you then you are generally going to get much better results. (U)
Illustration	Some patients might need five minutes of education, another patient may need two or three sessions where it is quite intensive, or they might need to cover different areas, so I think it depends on the patient that you have in front of you similar to what exercise you prescribe. (P1, PT) (p. 3)
Finding	What challenges and enablers should be considered in RT education delivery? 'Maybe we can get better?' (U)
Illustration	Work together in a positive pathway with me describing the exercises and illustrating how to do them and motivate patients and have the patients adhere to the programme. Because adherence is the key to the success. If they come back and they say, well, I forgot your exercises. I did them once a week instead of every day, then we are not moving forward ... so it is a shared responsibility. (P2, PT) (p. 3)

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