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Reporting of exercise descriptors and variables in resistance training interventions for lower limb tendinopathy: Protocol for a scoping review applying the consensus on exercise reporting template and Toigo and Boutellier framework

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Abstract

Introduction: Musculoskeletal disorders have a significant global burden, with tendinopathies of the lower limb having a high prevalence. Although the use of resistance training interventions as treatment for tendinopathies has become widespread, the reporting and description of these interventions is often poor, preventing translation to clinical practice. Specific exercise description and intervention variables must be reported in order to translate research findings into clinical practice. This scoping review aims to summarise reporting of current resistance training interventions as assessed by the Consensus on Exercise Reporting Template and Toigo and Boutellier Framework.

Methods and analysis: The recommended methodological framework described by the Joanna Briggs Institute will be used to structure this review, with reporting in accordance with the PRISMA-ScR. Databases to be searched include MEDLINE, CINAHL, AMED, EMBase, SPORT Discus, Cochrane library (Controlled trials, Systematic reviews), JBI Evidence Synthesis, and five trial registries. Two independent reviewers will screen studies at title/abstract and full text. Following screening, data will be extracted and charted, then presented as figures and table alongside a narrative synthesis.

Dissemination: This scoping review will evaluate current resistance training exercise descriptors and program variables in lower limb tendinopathy using recommended frameworks for the first time in the literature. The results will allow dissemination of the parameters of research exercise interventions to clinical practitioners through peer-reviewed publication and social media outlets, allowing implementation in clinical practice. The review will also outline future research and exercise reporting needs within tendinopathy resistance training interventions.

Keywords: tendinopathy; resistance training; exercise; physiotherapy.

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Introduction

Tendinopathy represents a spectrum of potential changes to healthy tendons, leading to tendon damage and disease, with changes characterised by abnormal tendon composition and cellularity, ultimately leading to altered tendon microstructure [1]. In tendinopathic tendons, the normal arrangement of collagen fibres and organisation of tenocytes become altered, typically by mechanical overuse, which lead to the main tendinopathy symptoms of pain, inflammation or swelling and impaired physical function and performance [2]. Despite all healthy tendons having the capability to progress to tendinopathy, tendons of the lower limb including the hip, knee and ankle most commonly undergo tendinopathic changes, with their collagen matrix in states of disrepair, which may be due to the increased risk of mechanical overload in the lower limb [3]. Although the aetiology of tendinopathy has yet to be fully elucidated, it is considered the result of a disrupted tendon healing process, with the hallmarks of collagen derangement, neovascularisation, altered tendon structure and tissue calcification [4]. Tendinopathies account for up to 30% of all sports related injuries witha range of extrinsic and intrinsic risk factors identified, suggesting that each individual pathogenesis of tendinopathy is multifactorial [5,6]. Epidemiological research from the Netherlands and Denmark on lower limb tendinopathies estimate incidence and prevalence ranging from 7.0-11.8 and 10.5-16.6 per 1000 people, respectively [7,8]. The higher prevalence of patellar and Achilles tendinopathy found in athletes may be related to repetitive tendon microtrauma from repeated athletic movements such as running, jumping and landing [9]. Prevalence of Achilles and patellar tendinopathy have been reported to be as high as 23 and 45% in runners and jumping athletes, with plantar heel pain reported to be found in up to 18% of runners in one cohort [10-12]. Despite a recent proliferation in clinical research investigating effectiveness of a range of treatment options for tendinopathy, it remains unclear which treatments are most effective, with exercise-based treatments such as resistance training currently the most recommended [13,14]. Common adjunctive treatments to exercise used frequently in clinical practice include shockwave therapy, ultrasound, low-level laser therapy, manual therapy and corticosteroid injections [15].

Isolated eccentric resistance training and heavy slow resistance training involving isotonic contractions, have been shown to have favourable outcomes for common lower limb tendinopathies including gluteal, Achilles, patellar, and plantar heel pain [16-19]. The high loads encountered during resistance training may stimulate tendon healing by counteracting structural tendon alteration, leading to reorganization and remodelling of collagen fibres, therefore improving the mechanical properties of tendons [20]. Despite positive outcomes, a limitation of current resistance training interventions in tendinopathy research is that description, prescription and progression of exercises and program variables are often poorly defined and reported, making translation to clinical practice difficult [21]. If the exercise dosage and parameters prescribed clinically is insufficient, then the mechanobiological stimulus may not be adequate to initiate tendon healing and positive outcomes from intervention [22]. Despite the optimal dosage of resistance training for tendinopathy being unknown [23], research has shown an association between positive outcomes and higher exercise dosages in other musculoskeletal disorders [24].

In recent years, several guidelines or frameworks have been developed for reporting exercise interventions and specific exercise details within research studies in order to enhance reproducibility of exercise interventions and their translation to and implementation in clinical practice [25]. The need to standardise reporting of components of exercise interventions has been highlighted in recent years, which lead to the development of The Consensus on Exercise Reporting Template (CERT), which advocates reporting detailed descriptions of exercises and their variables such as progression and tailoring, to allow clinical replication [26]. However, a limitation of the CERT is its omission of mechanobiological resistance training descriptors such as those included in the Toigo and Boutellier framework, such as rest intervals, time under tension and relative load [27]. Holden et al [28] recently highlighted how the poor reporting of exercise interventions in patellofemoral pain limits the clinical translational of exercise research findings in this population, with the authors recommending that future studies should use both the CERT and Toigo and Boutellier framework in conjunction as they report different aspects of exercise prescription and would therefore be complementary. It is unclear if a similar issue exits within the interventional exercise literature in lower limb tendinopathies as no previous reviews have been conducted investigating the reporting of exercise descriptors using recommended frameworks. Although reporting of exercise interventions using the CERT has been recommended in tendinopathy to improve transparency and clinical translation, it is unclear if this recommendation has been widely adopted in research studies [29-31]. Both the CERT and Toigo and Boutellier framework are recommended templates and have been used in several review studies evaluating exercise descriptions and variables in rehabilitation for musculoskeletal disorders other than tendinopathy [28,29,32-34].

Although there has been a proliferation of clinical research examining resistance training treatment interventions for lower limb tendinopathies in recent years, it is unclear if these interventions have been sufficiently reported and described to allow clinical replication and implementation, with a comprehensive scoping review of the current literature an ideal way to investigate this question [29]. A search of MEDLINE, CINAHL, JBI evidence synthesis, Cochrane Library and PEDro identified several systematic reviews investigating specific resistance training practices for individual tendinopathies. There are currently some registered reviews investigating outcomes of exercise interventions in tendinopathy, but none with the objective of evaluating the reporting of exercises and variables within interventions using recommended frameworks such as the CERT or Toigo and Boutellier framework. One systematic review protocol was identified with the aim of investigating the effectiveness of different exercise types for lower limb tendinopathies [35]. Not completed, or in-progress scoping reviews were found to match the objectives of the present study, namely the evaluation of the reporting of exercise descriptors and variables in exercise interventions for lower limb tendinopathies using recommended frameworks.

Methods

Review objective/questions:

The objective of this scoping review is to evaluate the reporting of exercise descriptors and programme variables used within resistance training interventions for treating lower limb tendinopathies. The scoping review will be guided by addressing the following review questions on specific aspects of exercise reporting within lower limb tendinopathy resistance training interventions:

1. What exercises and program variables are used in resistance training interventions for lower limb tendinopathy?

2. How complete is the reporting of the exercise descriptors and programme variables as assessed by the CERT and the Toigo and Boutellier framework.

Inclusion criteria

The inclusion criteria for the scoping review will be guided by a modified PICO (PCoCo) as recommended for scoping reviews [36].

Participants/population

The review will include adults aged eighteen years or older with a diagnosis of a lower limb tendinopathy for any time duration. All lower limb tendinopathies will be included, such as gluteal, hamstring, patellar, Achilles, tibialis posterior and peroneal tendinopathy. Plantar fasciopathy, also referred to as Plantar heel pain will be included as it is considered to have a similar pathophysiology to tendinopathy and should therefore be treated in accordance with other lower limb tendinopathies according to recent literature [21]. Any tendon condition characterised by common tendinopathy symptoms, in the absence of a full thickness tendon rupture will be considered for inclusion. A clinician's diagnosis based on verifiable clinical features including pain location and a symptom altering response to palpation or tendon loading with specific tendinopathy tests will be accepted for inclusion [1]. Strategies to rule out other conditions through diagnostic imaging such as ultrasonography or magnetic resonance imaging confirmation of structural change willbe permitted.

Concept

The concept of interest is resistance training for the treatment of lower limb tendinopathies, including any type or format such as exercise performed with body weight or external resistance. Therefore, any type of resistance training, including eccentric, concentric, isotonic, isometric, plyometric, heavy slow resistance training, general strength training or combinations of these exercise types. The resistance training may be used as a first or second-line intervention for tendinopathy and may be delivered in isolation or combined with other treatments. Resistance training may be delivered acrossa range of settings and health or exercise professionals (e.g., physiotherapists, strength & conditioning coaches, sports therapists, personal trainers, medical doctors, orthopaedic surgeons). Resistance training interventions may be delivered in a supervised or unsupervised (self-management or home training) manner, using any methods for training progression and monitoring.

Context

The context considered for inclusion will include any setting in which resistance training interventions for lower limb tendinopathy have been provided. These include physiotherapy clinics and departments, outpatient departments, any primary or secondary care settings, specialist orthopaedic or surgical clinics, rehabilitation clinics, sports medicine clinics, community locations, leisure facilities, gyms and private home settings.

Types of studies/sources

This scoping review will consider both experimental and quasi-experimental study designs including randomized controlled trials and non-randomized controlled. In addition, prospective and retrospective cohort studies, case series and case reports will be considered for inclusion. Unpublished studies or reports will not be considered for inclusion.

Methodology

The proposed scoping review will be conducted in accordance with the Joanna Briggs Institute (JBI) methodology for scoping reviews [36]. The scoping review will be reported in accordance with the Preferred Reporting Items for Systematic reviews and Meta-analysis extension for Scoping reviews known as the PRISMA-ScR [37]. This scoping review will evaluate current resistance training exercise descriptors and program variables in lower limb tendinopathy using recommended frameworks for the first time in the literature. The results will allow dissemination of the parameters of research exercise interventions to clinical practitioners through peer-reviewed journal publication and through social media outlets to increase the reach of the findings, allowing increased likelihood of implementation in clinical practice [28]. The review will also outline future research and exercise reporting needs within lower limb tendinopathy resistance training interventions.

Search strategy

A 3-step search strategy will be implemented in this scoping review. It will incorporate the following: 1) a limited search of MEDLINE and CINAHL using initial keywords as detailed in Appendix 1, followed by analysis of the text words in the title/abstract and those used to describe articles in order to develop a full search strategy; 2) The full search strategy will be adapted to each database and applied to MEDLINE, CINAHL, AMED, EMBase, SPORT Discus, Cochrane library (Controlled trials, Systematic reviews), JBI Evidence Synthesis, and PEDro. The following trial registries will also be searched: Clinical Trials.gov, ISRCTN, The Research Registry, EU-CTR (European Union Clinical Trials Registry), ANZCTR (Australia and New Zealand Clinical Trials Registry). Databases will be searched from 2000 to 2020. Although Stanish and Curwin [38] first published on the concept of eccentric resistance training in 1986, it was only following the publication of the Alfredson protocol in 1998 [39] that resistance training became widespread in lower limb tendinopathy rehabilitation. The year 2000 will be used as there was a proliferation on interventional research around this time. Including findings from studies published more than 20 years ago may not be relevant due to recent advances in both research methodologies and clinical practice for tendinopathy [1]. The search for grey literature will include: Open Grey, Med Nar, Cochrane Central Register of Controlled Trials (CENTRAL), EThOS, CORE, and Google Scholar. 3) For each article located in steps 1 and 2, a search of cited and citing articles using Scopus and handsearching where necessary, will be conducted. Studies published in a language other than English will only be included if a translation is available as translation services are not available to the authors.

Study selection

Following the search, all identified citations will be collated and uploaded into Ref Works and duplicates removed. Titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant studies will be retrieved in full, and their citation details imported into Covidence (Veritas Health Innovation, Melbourne, Australia). Two independent reviewers will assess the full text of selected citations in detail against the inclusion criteria. Any disagreements that arise between the reviewers at each stage of the study selection process will be resolved through discussion or by input from a third reviewer. The results of the search will be reported in accordance with the PRISMA-ScR [37].

Data extraction

Data will be extracted from sources included in the scoping review by one reviewer, with independent data extraction by a second reviewer for at least 10% of studies using data extraction tools developed specifically by the reviewers for each source type. The data extracted will include specific details regarding the population, concept, context, study methods and key findings relevant to the review questions. Any disagreements that arise between the reviewers will be resolved through discussion. The data extracted will include dimensions such as authors, year of publication, country of origin, study type, purpose, population & sample size, methods, details of resistance training intervention, specific exercises and outcome measures used. Details of the resistance training interventions will include setting, mode of delivery, type, dosage, and methods used to progress and adjust the training stimulus. Details of the population will include dimensions such as age, gender, body mass index, sport or activity level, and duration of tendinopathy. The contents and variables of the specific resistance training exercises will be extracted using the 13-item Toigo and Boutellier framework for exercise mechanobiological description and will include parameters such as repetitions, load magnitude and time under tension. General information from the resistance training interventions such as exercise supervision and delivery methods will be extracted using the CERT tool. Both the CERT and Toigo and Boutellier framework are recommended templates and have been used in several studies evaluating the reporting of exercise descriptions and parameters in a musculoskeletal rehabilitation context [28-33].

Risk of bias (quality) assessment

In accordance with guidance on conducting scoping reviews, critical appraisal will not be conducted [36].

Data synthesis

The extracted data will be presented in tabular form as tables and figures, in a manner that aligns with the objective of this scoping review. A narrative summary will accompany the tabulated results and will describe how the results relate to the review objective and questions.

Ethics and dissemination

This scoping review will evaluate current resistance training exercise descriptors and program variables in lower limb tendinopathy using recommended frameworks for the first time in the literature. The results will allow dissemination of the parameters of research exercise interventions to clinical practitioners through peer-reviewed publication and social media outlets, allowing implementation in clinical practice. The review will also outline future research and exercise reporting needs within tendinopathy resistance training interventions. Ethical approval is not required for the scoping review as it does not involve human participants or unpublished secondary data.

Declarations

Acknowledgements: None declared

Authorship contributions: IB conceptualised the work and developed the methods, search strategy and framework for the review. IB and AM contributed to the development of the research questions and the study design. All authors developed the first and subsequent drafts of the manuscript and reviewed and approved the manuscript.

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Data availability statement: All data relevant to the study are included in the article or uploaded as supplementary information.

Appendices

Appendix 1: MEDLINE search strategy

1. MH tendinopathy OR MH fasciitis, plantar KWtendin* OR KW tendon* OR KWtendinopath* OR KW plantar OR KW Achilles OR KW Patellar OR KW Gluteal OR KW Greater trochanter*)

2. MH resistance training OR MH exercise OR MH physical therapy modalities OR MH physical therapy specialty OR KW physiotherapy OR KW physical therapy OR KWexercis* OR KW strength training OR KW training

3. 1 AND 2

KW: Keyword; MH: Mesh Heading

Dates 2000-2020

Planned limits: English language only.

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