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ICON 2020—International Scientific Tendinopathy Symposium Consensus: A Scoping Review of Psychological and Psychosocial Constructs and Outcome Measures Reported in Tendinopathy Clinical Trials

OBJECTIVE: To identify and describe the psychological and psychosocial constructs and outcome measures used in tendinopathy research.

DESIGN: Scoping review.

LITERATURE SEARCH: We searched the PubMed, EMBASE, Scopus, Web of Science, PEDro, CINAHL, and APA PsychNet databases on July 10, 2021, for all published studies of tendinopathy populations measuring psychological and psychosocial factors.

STUDY SELECTION: Studies using a clinical diagnosis of tendinopathy or synonyms (eg, jumper's knee or subacromial impingement) with or without imaging confirmation.

DATA SYNTHESIS: We described the volume, nature, distribution, and characteristics of psychological and psychosocial outcomes reported in the tendinopathy field.

RESULTS: Twenty-nine constructs were identified, including 16 psychological and 13 psychosocial constructs. The most frequently-reported constructs were work-related outcomes (32%), quality of life (31%), depression (30%), anxiety (18%), and fear (14%). Outcome measures consisted of validated and nonvalidated questionnaires and 1-item custom questions (including demographics). The number of different outcome measures used to assess an individual construct ranged between 1 (emotional distress) and 11 (quality of life) per construct.

CONCLUSION: There was a large variability in constructs and outcome measures reported in tendinopathy research, which limits conclusions about the relationship between psychological and psychosocial constructs, outcome measures, and tendinopathies. Given the wide range of psychological and psychosocial constructs reported, there is an urgent need to develop a core outcome set in tendinopathy. *J Orthop Sports Phys Ther 2022;52(6):375-388. doi:10.2519/jospt.2022.11005*

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Psychological and psychosocial factors are determinants of health, and they are associated with poor recovery in those with musculoskeletal conditions.[4,9] *Psychological* factors such as pain-related fear, catastrophizing, self-efficacy, and personality traits influence the experience of pain.[23,80,105,108,148] These factors are important prognostic indicators, treatment effect modifiers, or mediators of recovery of health across a range of musculoskeletal conditions and general disorders.[12,29,41,67,101,146,147,156] *Psychosocial* factors such as quality of life, employment, education, and social support are also prognostic indicators for musculoskeletal pain, but they have been scarcely investigated in tendinopathy.[73,88,112,171,181] For this review, we distinguished factors as either *psychological* or *psychosocial* constructs.

Exercise is the nonsurgical treatment of choice for tendinopathy.[125] Exercise interventions such as the Silbernagel concentric/eccentric program[151] and heavy slow resistance training[16] are associated with improved clinical outcomes in individuals with lower limb tendinopathy.[117]

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However, exercise is not a panacea: there are modest effects when comparing exercise to nonexercise interventions.[86] Studies evaluating exercise interventions have focused on the contribution of tendon structure or exercise parameters (eg, mode of contraction and exercise intensity) and their relationship to outcomes. However, evidence is conflicting about which exercise type or intensity is associated with superior outcomes in tendinopathy.[24,36,95,115] The long-held belief that improved clinical outcomes are associated with structural alterations following exercise interventions in tendinopathy is not supported.[60,128,172] These findings highlight the need to view tendinopathy from a multidimensional biopsychosocial perspective.

A recent systematic review[159] has found a weak-to-moderate association between psychological factors and pain, disability, and physical functional outcome in tendinopathy. The importance of psychological and psychosocial factors in tendinopathy has also been recently recognized by the International Consensus on Tendinopathy Group (ICON tendinopathy). The ICON tendinopathy consensus defined core outcome domains via a Delphi consensus study involving health care professionals and patients.[168] Psychological factors were included as 1 of the 9 core health-related outcome domains to assess tendinopathy clinical trials following the Delphi process.

While tendinopathy-specific outcome measures exist for many of the identified core outcomes (eg, function, disability, or pain), there is a lack of agreement on the most appropriate psychological outcome measures for tendinopathy. The Achilles tendinopathy consensus group (ICON Achilles, a subgroup of COS tendinopathy) only identified 3 studies in a recent systematic review that assessed psychological factors within prospective studies.[71] Unfortunately, *psychological* and *psychosocial* are sometimes used interchangeably in the literature, making it difficult to interpret which factor is under investigation. The ICON Psych Working Group was tasked with identifying psychological and psychosocial outcomes that have been used in tendinopathy research.

The ICON Psych Working Group's work will inform a subsequent Delphi study asking patients, clinicians, and researchers about the most important psychological and psychosocial constructs and outcome measures in tendinopathy. Future research should investigate the validity of existing psychological and psychosocial outcome measures in a tendinopathy-specific population to inform their use in research and clinical practice. These steps will build on the recommendations of ICON 2019 and facilitate more targeted interventions for this challenging musculoskeletal condition. Consequently, the aim of this scoping review was to outline the evidence concerning psychological and psychosocial *outcomes* in tendinopathy research. Due to the exploratory and descriptive nature of the question, a scoping review was the most appropriate review methodology to address the research question.[11]

METHODS

The general purpose of scoping reviews is to identify and map the available evidence.[124,136,163,164] This aligns with the objectives of the ICON Psych Working Group. The study selection process is reported using the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.[164]

Design

The scoping review was informed by the framework recommended by the Joanna Briggs Institute.[83] The framework provides guidance for the review process, including an initial identification of the research question and relevant studies, data extraction, presentation, and interpretation of results.[124,164] The scoping review followed the established 5-stage process as outlined by Arksey and O'Malley.[11]

Stage 1: Identifying the Research Questions

Literature searches and multidisciplinary discussions were undertaken within the ICON Psych Working Group to inform and identify the research questions. Using a concept (psychological/psychosocial factors and outcome measures) and target population (tendinopathy), we formulated 4 broad research questions to guide the development of the scoping review as follows.

(1) Report all constructs and outcome measures used to assess psychological factors in tendinopathy research.
(2) Report the frequency of all constructs and outcome measures used to assess psychological factors in tendinopathy research.
(3) Report all constructs and outcome measures used to assess psychosocial factors in tendinopathy research.
(4) Report the frequency of the constructs and outcome measures used to assess psychosocial factors in tendinopathy research.

Stage 2: Identifying Relevant Studies

An a priori decision was made to include a broad range of psychological and psychosocial constructs and the outcome measures used to evaluate these constructs that have been reported in the musculoskeletal literature.[54,116,166,181] Emotional, cognitive and behavioral factors were considered as *psychological* constructs, as previously defined by Linton and Shaw.[108] *Psychosocial* constructs considered were factors that align with the social determinants of health as per the World Health Organization definition: "Conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life".[181] The final categorization was not set a priori as it was dependent on the number of papers that reported the same constructs. Examples of psychological and psychosocial constructs that were considered are as follows.

Psychological Factors

- *Emotional factors* including, but not limited to, depression, distress, anxiety,

hypervigilance/somatization, stress, and anger
- *Cognitive factors* including, but not limited to, maladaptive beliefs, fear, kinesiophobia, catastrophizing, negative pain beliefs, and self-efficacy
- *Behavioral factors* including but not limited to avoidance, (negative) coping styles (negative), pain, or sleep interference

Definitions of all relevant psychological outcomes are outlined in **SUPPLEMENTAL FILE 1**.

Psychosocial Factors

- *Quality of life*
- *Education*
- *Work-related constructs* including income, unemployment, type of work, full-time vs part-time employment, and return to work
- *Place of residence* urban versus rural
- *Race and ethnicity*
- *Socioeconomic status*
- *Social capital and networks* including social exclusion and social support

Inclusion Criteria

- Studies using a clinical diagnosis of tendinopathy or synonyms (eg, jumper's knee or subacromial impingement) with or without imaging confirmation. The most commonly reported tendinopathies in the scientific literature were the focus of this review, including the following:
  - Achilles
  - Patellar
  - Gluteal
  - Hamstring
  - Lateral elbow
  - Rotator cuff
  - Plantar heel
- Participants >18 years old.
- A minimum sample of 10 participants with tendinopathy.
- All populations (ie, athletes, nonathletes, no restrictions on disease duration or any other factor).
- Any research design reporting quantifiable psychological or psychosocial outcome measures, including randomized trials, observational (cohort and cross-sectional) studies, and case series.

Exclusion Criteria

- Studies that selectively recruited participants with tendon tears (partial or full thickness) or ruptures.
- Studies involving multiple musculoskeletal pathologies unless the tendinopathy cohort could be disaggregated from the overall cohort.
- Abstracts or conference papers.
- Animal studies and in vitro experiments.
- Studies where the full-text version was not available.

The literature search was performed on July 10, 2021, by 2 authors of the working group (MP and SMC). The search strategy involved MeSH terms and free-text words for tendinopathy clinical diagnoses, psychological factors, and psychosocial factors. The following online databases were searched: PubMed, EMBASE, Scopus, Web of Science, PEDro, CINAHL, and APA PsychNet. All identified articles were collected in Endnote and imported into Covidence (www.covidence.org). Duplicates were removed using an inbuilt function in Endnote and manually screened by one of the reviewers (MP) before being exported into Covidence. A list of search terms based on psychological and psychosocial factors defined previously is provided in **TABLE 1**.

Stage 3: Study Selection

Titles and abstracts were evaluated by members of the ICON Psych Working Group. The working group split into pairs with each pair undertaking independent double screening of a proportion of the abstracts. The same process was completed for full-text screening of studies that passed the first screening stage. After both screening steps, the core group (SMA, MP, PM, AM, and CS) met to resolve any disagreements between the members of the broader ICON Psych Working Group. Additionally, the reference lists of the included full-text articles were examined to identify any further relevant studies not previously been found by the electronic search.

Stage 4: Data Extraction—Charting the Data

Data were extracted per the guidelines outlined by the Joanna Briggs Institute.[83] The data extraction sheet is provided in the **APPENDIX**. Specifically, author information, type of study, tendon sites, age, sex, the type of psychological/psychosocial construct, and outcome measures were extracted. If possible, means (standard deviations) were extracted to support the

TABLE 1 Search Constructs That Were Adapted for Each Search Strategy per Electronic Database

1. Tendinopathy	2. Psychological Constructs	3. Psychosocial Constructs
Tendinopathy OR bursitis OR rotator cuff OR shoulder impingement syndrome OR subacromial impingement OR elbow tendinopathy OR tennis elbow OR lateral epicondyl* OR gluteal tendin* OR greater trochanteric pain syndrome OR gluteal bursitis OR trochanteric bursitis OR lateral hip pain OR jumper's knee OR patellar tendin* OR achilles tendon OR tendoachilles OR Plantar fasc* OR heel pain	Psychological OR psycholog* response/ readiness/ distress OR mental health OR anxiety OR depression OR depressive disorder OR mood disorders OR fear OR fear of reinj* OR fear-avoidance OR kinesiophob* OR wakefulness OR vigilance OR hypervigilance OR stress OR emotions OR emotional distress OR catastrophi* OR self efficacy OR adaptation, psychological OR coping OR resilience OR self concept OR self-esteem OR optimism	Social support OR motivation OR social behaviour OR attitude OR goal setting OR perception OR mindfulness OR well-being OR empathy OR compassion OR education OR trust OR communication social class OR socioeconomic status OR culture OR ethnicity OR ethnic groups OR employment OR urban OR rural
Full search #1 AND (#2 OR #3)		

narrative synthesis. Given the iterative nature of scoping reviews, if additional data could be charted and extracted during this process, other categories of tables were added or table headings updated if needed. Data extraction was performed independently by the same pairs that undertook study selection; the core group discussed disagreements. The extraction framework was piloted by members of the core group (SMA, MP, PM, AM, and CS) on a small sample of studies to ensure consistency of application of the coding framework prior to completing the data extraction. The core group (SMA, MP, PM, AM, and CS) resolved any questions arising during this piloting process, and the data extraction framework was revised accordingly.

Stage 5: Collating, Summarizing, and Reporting the Results

The aim was to report relevant information on the volume, nature, distribution, and characteristics of published studies in psychological and psychosocial factors in tendinopathy. Consequently, a descriptive-analytical method was used by applying a common analytical framework to all the primary research reports and collecting standard information on each study.[11,91] Where appropriate, medians were used to describe the central tendency of the extracted means to support the narrative synthesis. Results are presented as recommended by best practice using a map of the data in a logical, diagrammatic, or tabular form and/or in a descriptive format that aligned to the objectives and aim of the review.[136]

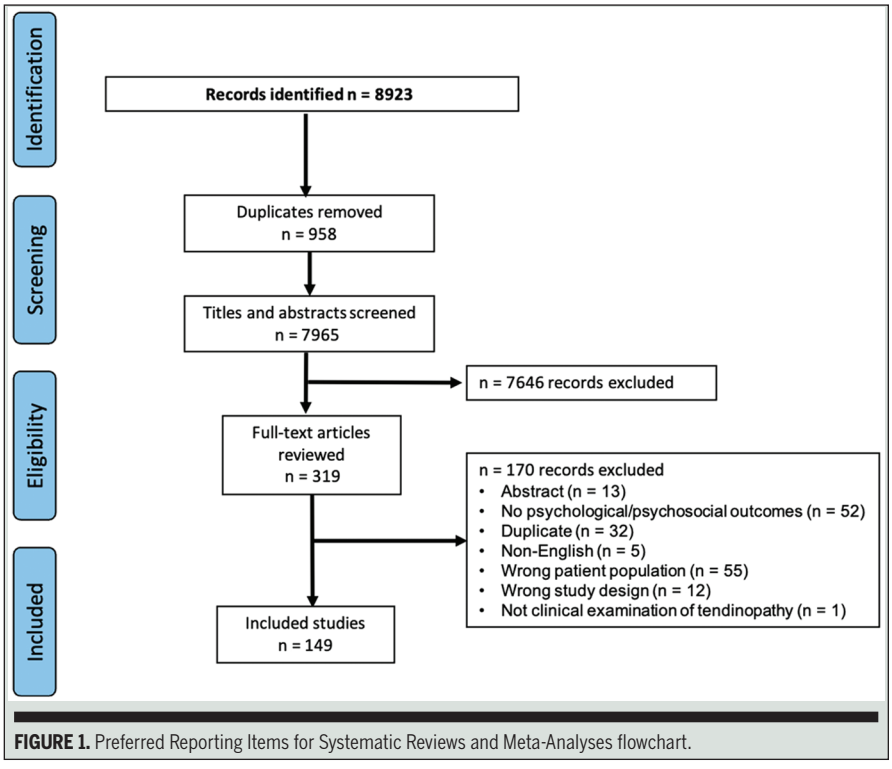

FIGURE 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart.

RESULTS

Study Selection and Characteristics

The electronic search identified 8923 studies. After removing 958 duplicates, 7965 records were screened on title and abstract, with 319 included for full-text review. Finally, 149 studies were included (**FIGURE 1**). Of the 149 studies, 36 studies were randomized controlled trials, 98 observational (59 cohorts and 39 cross-sectional) studies, 7 case series, 3 audits, 1 repeated-measures design, 3 nonrandomized controlled trials, and 1 chart review. Most studied tendon sites were rotator cuff tendinopathy (studies = 62: n = 7327), followed by the lateral elbow tendinopathy (n = 40: n = 3965), Achilles tendinopathy (n = 19; n = 1739), plantar heel pain (n = 16: n = 935), and gluteal tendinopathy (n = 7: n = 27980). The median number of participants was 68, and the total number of participants with tendinopathy in the 149 studies was 42 046. Age was reported in 119/149 (80%) studies, with a mean age of 48 years. The average duration of symptoms was 19 months reported in 52/149 (35%) studies. The remaining studies reported symptoms as categories, reported median values, or did not report duration at all. Further details relating to the characteristics of the studies are outlined in **SUPPLEMENTAL FILE 2.**

Psychological Factors

Anxiety Anxiety was investigated in 27/149 (18%) studies. The most common outcome measure was the Hospital and Anxiety Depression Scale (HADS) reported in 14/26 (54%) studies.[1,5-7,32,38,39,76,84,139,140,179,180] The HADS was originally developed as a self-report instrument to detect and measure the severity of depression and anxiety.[184] It has 2 separate subscales for anxiety and depression and has been used extensively with psychiatric, medical, rheumatological, and chronic pain patients (16). The HADS (15) comprises 14 items (7 items for depression and 7 items for anxiety) rated on a 4-point scale from 0 (*absence*) to 3 (*extreme*) with a total score of 42 (21 per subscale). A total score is generated for each anxiety and depression subscale, with higher scores indicating a higher level of anxiety or depression. The median anxiety score across 12 studies that reported means was 5.8/21 (range: 3-9.2). Tendon sites using the HADS varied: lateral elbow tendinopathy (n = 4), rotator cuff tendinopathy (n = 4), gluteal tendinopathy (n = 2), plantar heel pain (n = 2), and Achilles tendinopathy (n = 2). Five studies used the Depression, Anxiety and Stress Scale–Short Form (SF) 21 (DASS-21).[44,46,47,79,130] The median DASS score of 4 studies

reporting the mean was 4.2 (range: 3.8-12.20). The remaining studies used the Pain Anxiety Symptom Scale,[51,127,144] Symptom Check List-90,[167] Four-Dimensional Questionnaire,[96] MASS Mood Scale,[142] a single question from the Outcome Evaluation Questionnaire,[113] and a chart-based diagnosis.[135]

Depression Depression was investigated in 34/149 (23%) studies. The HADS was the most used outcome measure, reported in 12/34 (35%) studies.[1,5-7,32,76,84,121,139,140,178,179] The median of HADS mean score across studies was 3.9/21, with a range between 1.7 and 6.2. Tendon sites using the HADS varied: rotator cuff tendinopathy (n = 4), Achilles tendinopathy (n = 2), lateral elbow tendinopathy (n = 2), gluteal tendinopathy (n = 2), patellar tendinopathy (n = 1), and plantar heel pain (n = 1). The Beck Depression Inventory was used in 6 studies.[4,59,74,97,122,134] The mean score was specified in 4/6 studies. The median Beck Depression Inventory score across the studies was 10.2, ranging between 4.6 and 16.3. Tendon sites using the Beck Depression Inventory rotator cuff tendinopathy (n = 4), lateral elbow tendinopathy (n = 1), and plantar heel pain (n = 1). The Depression, Anxiety, and Stress Scale was used in 5 studies, and the median of reported mean scores was 7.2 (range: 6.4-9.9; n = 4).[44,46,47,79,130] The remaining studies used the Centre for Epidemiological Studies–Depression Scale (n = 3), Patient Health Questionnaire (n = 2), Four-Dimensional Symptom Questionnaire (n = 1), EuroQol 5-Dimension (EQ-5D) depression anxiety scale (n = 1), Outcome Evaluation Questionnaire (2 valid questions) (n = 1), and chart-based diagnosis (n = 1).

Catastrophizing Catastrophizing was investigated in 15/149 (10%) studies. The most common outcome measure was the Pain Catastrophizing Scale reported in 14/15 (93%) studies.[31,38,43,53,68,74,76,79,84,98,130,134] The catastrophizing pain scale is a 13-item self-report measure designed to assess catastrophic thinking related to pain. The Pain Catastrophizing Scale has several subscales: 3 items measuring magnification, 4 items measuring rumination, and 6 items measuring helplessness. The 13 items are rated on a 5-point Likert scale from 0 (*not at all*) to 4 (*all the time*). A total score of 30 indicates a clinically relevant level of catastrophizing.[160] The mean score was specified in 12/14 studies. The median score of means across studies was 13.6 with a range between 5 and 30. Tendon sites using the Pain Catastrophizing Scale varied: gluteal tendinopathy (n = 5), lateral elbow tendinopathy (n = 3), rotator cuff tendinopathy (n = 2), Achilles tendinopathy (n = 3), and plantar heel pain (n = 1). The other remaining study used the Pain-Related Self Statement Scale.[69]

Fear The psychological construct fear was investigated in 22/149 (13%) studies. The most common outcome measure reported was the Tampa Scale of Kinesiophobia (TSK), reported in 16/20 (75%) studies.[15,31,38-40,42,43,61,62,77,118,121,140,141,150,151] The TSK is a 17-item scale used to subjectively measure fear of movement and unhelpful beliefs about pain. The scale is based on the model of fear avoidance, fear of work-related injury, and fear of reinjury. The TSK has 17 items rated on a 4-point Likert-type scale.[63,170] The scale consists of 2 subscales: a harm factor and an activity avoidance factor. Total score ranges from 17 to 68, with a cutoff score of 37 or over being considered a high score.[170] Tendinopathy groups using the TSK varied: Achilles tendinopathy (n = 6), lateral elbow tendinopathy (n = 5), gluteal tendinopathy (n = 2), rotator cuff tendinopathy (n = 1), plantar heel pain (n = 1), and patellar tendinopathy (n = 1). The long-form TSK was used in 10 studies, while the SF TSK was reported in the remaining 6 studies.[15,31,38-40,141] The median score of means from the long-form TSK across the studies was 32, with scores ranging from 26.9 to 38.7, whereas the median of the SF was 36.6 (range: 24.3-37.2; n = 3). Four studies used the Fear Avoidance Beliefs Questionnaire with mean scores of 14 for the physical activity subcomponent, while a mean score of 17 was reported for the work subscale.[68,70,99,102] The remaining study exploring fear as a psychological construct used a single question taken from the Pain and Impairment Relationship Scale.[113]

Mental Health Mental health outcomes were reported in 14/149 (9%) studies. The most common outcome measure was the SF-36 measured in 9/14 (64%) studies.[2,3,46,48,58,59,82,161,183] The remaining studies used the SF-12 (n = 3)[132,153,158] and the SF-8.[102] Developed by RAND in 1992, the SF-36 is a 36-question survey derived from the Medical Outcomes Study, a multiyear study to explain variations in patient outcomes.[173] Scores for each domain range from 0 to 100, with a higher score defining a more favorable health state. The median of SF-36 means was 51.7, with a range of scores between 41.2 and 79.3 (n = 8), and the median of the SF-12 was 51.9 (range: 43.8-56.6; n = 4) Mental health was explored across a range of tendon sites, with SF-36 used in 1 study in individuals with Achilles tendinopathy, 3 studies in individuals with plantar heel pain, 3 studies in individuals with rotator cuff tendinopathy, and 2 studies in individuals with lateral elbow tendinopathy.

Self-Efficacy Self-efficacy was reported in 12/149 studies (8%). The most common outcome measure was the Pain Self- Efficacy Questionnaire, reported in 6/12 (50%) of the studies.[29,120,130,139,141,143] The Pain Self- Efficacy Questionnaire is used to assess confidence in performing activities while in pain. Participants rate how confidently they can perform activities described on a 7-point Likert scale, ranging from 0 (*not at all confident*) to 6 (*completely confident*). Total scores range from 0 to 60, where higher scores reflect stronger self-efficacy beliefs.[126,162] The median of reported means across these studies was 47.7, with a range of scores between 37.0 and 50.0. Tendon sites using the Pain Self-Efficacy Questionnaire varied: Achilles tendinopathy (n = 1), gluteal tendinopathy (n = 3), rotator cuff tendinopathy (n = 2), and patellar tendinopathy (n = 1). The remaining studies used a General Self-Efficacy Scale and[109,110] Chronic Pain Self-Efficacy Scale,[61] while the remaining 2 studies used 7-point ordinal scales.[26,100]

Stress Six studies 6/149 (4%) investigated the role of stress in tendinopathy. The most common outcome measure for this construct was the stress component of the Depression, Anxiety and Stress Scale–SF (DASS-21), used in 5 (83%) studies.[44,46,47,79,130] The DASS-21 is a set of 3 self-report scales designed to measure the emotional states of depression, anxiety, and stress. Each of the 3 DASS-21 scales contains 7 items, divided into subscales with similar content. Each component is assessed using a 4-point Likert scale ranging from 0 to 3. Recommended cut-off scores for conventional severity labels (normal, moderate, and severe) are described in the literature.[111] A higher score on the DASS-21 indicates greater severity or frequency of negative emotional symptoms. Four studies explored stress in individuals with plantar heel pain, while the remaining study by O'Leary et al[130] explored the role of stress in rotator cuff tendinopathy. The median of reported means across these studies was 10.3, with a range of scores between 8.5 and 15.7. Finally, 1 study[175] measured perceived stress in individuals with upper extremity tendinopathy using a Job Content Questionnaire.

Emotional Distress Emotional distress was reported in 3/149 (2%) studies, all of which were performed in cohorts with rotator cuff tendinopathy.[25,26,57] All studies used the Hopkins Symptom Checklist with mean scores being reported in 2 of the 3 studies; means ranged from 1.43 to 1.60.

Other Psychological Variables Other psychological variables that were reported across the studies included somatisization, perfectionism, psychological symptoms, mood state, neuroticism, patient expectations, and burnout (**SUPPLEMENTAL FILE 2**).

Psychosocial Factors

Education Education level was reported in 9/149 (6%) studies[75,100,104,144,153,154,167,175,176] and years of education in 4 (3%, 4/145).[45,46,122,123] Education levels were mainly reported in categories.

Quality of Life Quality of life was reported in 54/149 studies (36%). The SF-36 was the most commonly reported outcome measure reported in 20 studies (37%, 20/54), including lateral elbow tendinopathy (n = 4), rotator cuff tendinopathy (n = 8), plantar heel pain (n = 6), and Achilles tendinopathy (n = 2). The SF-36 and the SF-12 (reported in n = 7 studies) are reported as general health/quality-of-life surveys reporting several subscales including a mental and social functioning subscale, which are reported in the "Mental Health" and "Other Psychosocial Outcomes" sections, respectively. The EuroQol, a 5-dimension quality-of-life scale, was used in 12/47 studies (26%),[28,35,36,38,68,84,100,114,120,131,140,178] including studies on rotator cuff tendinopathy (n = 6), Achilles tendinopathy (n = 2), lateral elbow tendinopathy (n = 1), plantar heel pain (n = 1), and gluteal tendinopathy (n = 2).

Of the 7 studies that reported means, the median of the mean index scores of the EuroQol was 0.7/1 (range: 0.5-0.7; n = 7). Other quality-of-life questionnaires included EQ-5D visual analog scale that ranged from 65.8 to 73/100 (n = 2), EQ-5D 3L (n = 1), World Health Organization Quality of Life (n = 3), Rotator Cuff Quality of Life (n = 2), Disabilities of the Arm, Shoulder and Hand (DASH)–Quality of Life (n = 1), Gothenburg Quality of Life (n = 1), Assessment of Quality of Life (n = 1), Foot and Ankle Outcome Score Quality of life component (n = 1), Western Ontario Osteoarthritis of the Shoulder index (n = 1), and The Western Ontario Rotator Cuff (n=1).

Work-related outcomes Work-related outcomes were reported by 49/149 studies (33%). Nine studies (18%) reported physical strain at work.[9,66,72,74,75,92,103,104,145] Types of physical strain included data on heavy loading and awkward postures measured with the Physical Workload Questionnaire (n = 2),[9,72] physical exposure measured with by trained ergonomic analysts (n = 1),[66] and categories of physical strain for example none, low, medium, high strain,[75] or lifting of heavy versus light loads.[92] Twelve studies (25%) reported psychosocial work factors that were assessed with the Karasek Job Content Questionnaire.[10,18,19,22,27,72,75,122,154,174,176] The Karasek Job Content Questionnaire produces work factor outcomes including job demands, decision latitude, social support, and job insecurity.[87] Duration of sick leave was reported by 7 studies[34,37,92,93,129,133,169] and return to work by 2 studies.[8,14] Employment status was reported in 8/49 (16%) studies.[37,52,89,93,144,157,165,175] The majority (>50%) of participants were currently employed, either full time (range: 62%-81%) or part time (range: 9%-15%). Employment type was reported in 9/49 (18%) studies.[17,18,27,68,85,89,106,119,123] Employment status and type of employment were presented descriptively, and as such, the vast majority of studies had not listed a description of the outcome or assessed these outcomes with a validated questionnaire. Examples of other work-related outcomes are job satisfaction, working ability, barriers to return to work, and sick leave benefits. All work-related outcomes can be found in **SUPPLEMENTAL FILE 2**. An overview of the psychological constructs for each domain is outlined in **FIGURE 2**.

Other Psychosocial Variables Other psychosocial variables that were reported included smoking status (n = 4), social functioning (n = 4), and emotional functioning (n = 3) - subscale of the SF-36, marital status (n = 2), confidence and social interaction scales of the DASH (n = 2), relations with other people measured with the SF - Brief Pain Inventory (n = 2), indigenous language (n = 1), and hobbies and activities (n = 1), sleep quality (n = 1), and coping strategies (n = 1). The median of social functioning means was 51.9/100 with a range from 43.8 to 56.6 (n = 4), and emotional role functioning ranged from 66.7 to 67.5/100 (n = 2).

DISCUSSION

Our scoping review aimed to describe the psychological and psychosocial constructs and outcome measures that have been used in tendinopathy research. Twenty-nine common constructs were identified: 16 psychologi-

cal and 13 psychosocial. Psychological outcomes were more commonly reported, specifically, depression (30%), anxiety (18%), and fear (14%). Work-related outcomes were the most common psychosocial outcome (in 32% of studies). Outcome measures consisted of validated and nonvalidated questionnaires and 1-item custom questions or data were simply reflected by self-reported demographics. The number of outcome measures used to measure psychological and psychosocial constructs ranged between 1 (emotional distress) and 11 (quality of life) per construct. Large variability in constructs and outcome measures is likely to limit data pooling and conclusions about the relationships between psychological and psychosocial outcome measures with tendinopathy.

Measuring psychological factors in people with musculoskeletal conditions is important, but currently, most evidence arises from conditions other than tendinopathy. Depressive symptoms are related to higher levels of pain intensity, more functional limitation and disability, and worse prognosis,[13,137] and they predict the transition from acute to persistent in individuals with low back pain and neck pain.[107,138] Pain catastrophizing is associated with worsening physical disability, higher health care costs, and the amplification of pain sensitivity among patients with low back pain and joint pain.[55,56] Fear avoidance beliefs (kinesiophobia) are predictive of developing chronic low back pain,[64,65,94,149] poor work-related outcomes,[81,177] reduced function,[78,155] and higher health care use.[90] In tendinopathy, the current evidence is limited to cross-sectional studies outlining the relationship between psychological and psychosocial outcomes and the presence or severity of tendinopathy. A systematic review[159] investigated the strength of association between psychological factors and clinical outcome in tendinopathy. There was low to very low certainty evidence for an association between psychological factors and greater self-reported pain and disability as well as impaired physical function in people with tendinopathy. There was low to very low certainty evidence for an association between higher levels of self-efficacy and lower levels of pain intensity.[159] By highlighting current practices and limitations related to the measurement of these outcomes in tendinopathy, we are taking steps toward developing this priority research area for tendinopathy.

Although it is tempting to make direct comparisons between the baseline values for the various psychological and psychosocial outcomes reported in the review

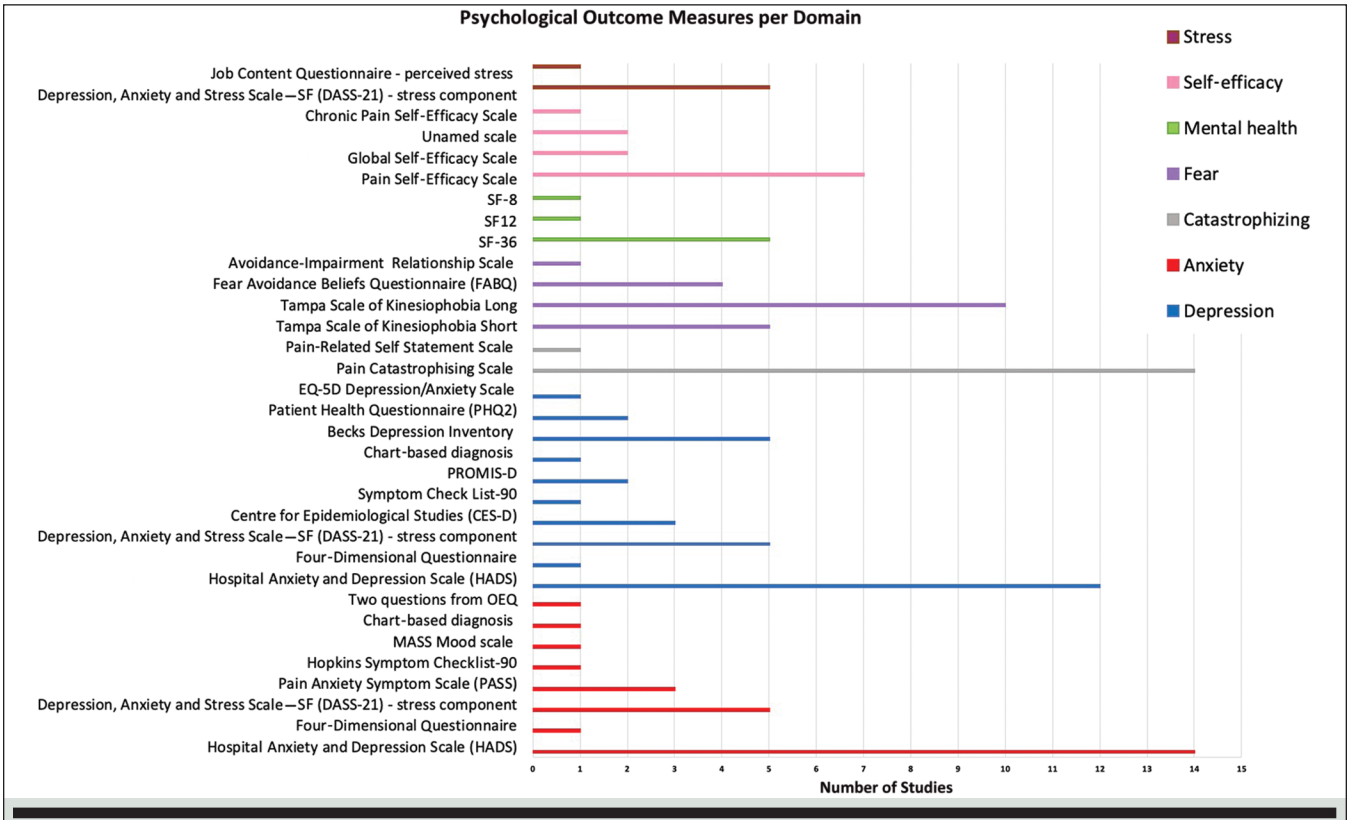

FIGURE 2. Psychological outcome measures per domain. EQ-5D, EuroQol 5-Dimension; OEQ, Outcomes and Experiences Questionnaire; PROMIS, Patient-Reported Outcome Measure Information System.

for people with tendinopathy to values reported in the literature for other musculoskeletal disorders, we urge caution. The psychological and psychosocial outcome measures reported in our review have not yet undergone psychometric evaluation in a population with tendinopathy. The outcome measures outlined in the review have been evaluated with participants with multiple pain sites (eg, widespread pain, headache, and leg pain), osteoarthritis, or in a population with persistent low back pain.[30] The measurement properties of an instrument are population specific and context specific, and they should be assessed before use in clinical research and practice in specific populations,[50] limiting direct comparisons with a tendinopathy population.

Implications of Findings

The recent international tendinopathy consensus group (ICON tendinopathy) has included psychological factors as 1 of the 9 core domains for tendon research.[168] Our scoping review highlighted sparse reporting of psychological and psychosocial factors in tendinopathy studies and the use of varied outcome measures. The issue of heterogeneity of outcome reporting highlights the need to develop and apply core outcome sets in future tendinopathy trials. Further, outcome measures of core outcome sets should adequately meet the criteria of *truth* (ie, validity), *discrimination* (ie, reliability and sensitivity to change), and *feasibility* (ie, be applied and interpreted easily) in order to be meaningful and relevant for clinicians and researchers alike.[20]

Developing a Core Outcome Set for Tendinopathy

We propose using a stepwise approach, the first step is to develop consensus on what constructs/domains to measure and report in future tendinopathy effectiveness studies. This consensus process is to be conducted using a modified Delphi method online survey to determine the core outcome set domains that are important to key stakeholders (patients, health care practitioners, and researchers). The domains then will be prioritized for their level of importance for clinical trials.[182] After a core outcome set is established, the working group will systematically assess the psychometric/clinimetric properties of the selected outcome measures to measure the core outcomes. Studies are only as credible as their outcome measures[21]; hence, to ensure credibility, the outcome measures must be validated in specific tendinopathy populations.[50] Establishing a core outcome set may lead to future research investigating whether psychological factors are prognostic factors, treatment effect modifiers, or mediators of recovery.[12,41,156] This may assist in identifying individuals with tendinopathy who may be at risk of poorer rehabilitation outcomes. Ultimately, this process will help inform clinical practice by identifying psychological factor(s) to consider or even address as part of a treatment intervention if it has been shown to mediate recovery.

Strengths and Limitations

The scoping design allowed us to identify and map a broad and diverse topic. This is the largest and most comprehensive review using a collaborative approach on the topic of psychological and psychosocial factors in tendinopathy. All study designs were eligible for inclusion in this scoping review. The entire screening process was undertaken by 2 independent members of the ICON Psych Working Group.

A limitation is that data extraction was not conducted by 2 researchers but divided among members of the ICON Psych Working Group. Data were cross-checked by members of the core group before syntheses commenced. The review excluded tendon sites outside of the 7 sites defined (eg, peroneal), instead favoring the most common tendinopathies in the scientific literature, as agreed a priori. We acknowledge the findings should not be extrapolated to all tendon sites. Case series with fewer than 10 participants were excluded. There were no restrictions on the population or clinical/diagnostic criteria, which may have biased our findings.

We intended to provide an overview of the psychological and psychosocial literature in tendinopathies, and not to provide guidance on which constructs or instruments should be used in certain populations. Factors were set apart as either psychological or psychosocial factors by the steering committee, which may have led to reporting bias. The most common factors are individually reported, and raw data are provided in the supplemental files to minimize bias. Future studies should assess which psychological and psychosocial factors are important in research and clinical practice, accounting for diagnostic criteria and specific populations (eg, athletic vs nonathletic populations). The core group categorized factors, constructs, and measurement instruments to enable data synthesis, which is influenced by the core group's backgrounds, knowledge, and motivations. To minimize bias, all the raw data are available in **SUPPLEMENTAL FILE 2.**

CONCLUSION

We identified 16 psychological and 13 psychosocial constructs. Work-related outcomes were the most common psychosocial outcome, reported in 32% studies. Quality of life (31%), depression (30%), anxiety (18%), and fear (kinesiophobia) (14%) were the most frequently reported psychological outcomes. Between 1 and 11 instruments were used to measure each construct.

KEY POINTS

FINDINGS: 149 studies were included in the review. Most studied tendon sites were rotator cuff tendinopathy (studies = 62), followed by the lateral elbow tendinopathy (n = 40), the Achilles tendinopathy (n = 19), plantar heel pain (n = 16), and gluteal tendinopathy (n = 7). Our review identified 16 psychological and 13 psychosocial constructs. Work-related outcomes were

the most common psychosocial outcome, reported in 32% studies. Quality of life (31%), depression (30%), anxiety (18%), and fear (kinesiophobia) (14%) were the most frequently reported psychological outcomes. Between 1 and 11 instruments were used to measure each reported psychological or psychosocial construct.

IMPLICATIONS: The recent international tendinopathy consensus group (ICON tendinopathy) has included psychological factors as 1 of the 9 core domains for tendon research. Our scoping review highlighted sparse reporting of psychological and psychosocial factors in tendinopathy studies and the use of varied outcome measures. Future research should investigate the validity of new and existing psychological and psychosocial outcome measures in a tendinopathy-specific population to inform their use in research and clinical practice.

CAUTION: Although it is tempting to make direct comparisons between the baseline values for the various psychological and psychosocial outcomes reported in the review for people with tendinopathy to values reported in the literature for other musculoskeletal disorders, we urge caution. The psychological and psychosocial outcome measures reported in our review have not yet undergone psychometric evaluation in a population with tendinopathy.

STUDY DETAILS

AUTHORS CONTRIBUTIONS: The following authors Sean Mc Auliffe, Melanie Plinsinga, Peter Malliaras, Adrian Mallows, and Carl Stubbs were involved in all aspects of the review and consequently the core authorship team. All five authors (myself included) contributed equally to the review. It was agreed that equal authorship is attributed to this group followed the wider group as listed. I, Sean Mc Auliffe will remain the corresponding and first named author for referencing e.g. Mc Auliffe et al 2022.

DATA SHARING: The protocol for the review is available on Open Science Framework, a public, open-access repository (https://osf.io/ugamz/?view_only=79aa5fb96e9645b68f58dd4f1206f7f0).

PATIENT AND PUBLIC INVOLVEMENT: No patient and public representatives were involved in the scoping review process.

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