Research Article

Psychological Predictors f Rehabilitation Success: The Role of Anxiety, Depression, And Self-Efficacy in Physiotherapy Outcomes After Orthopedic Injury

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Abstract

Orthopedic injury and rehabilitation following orthopedic surgery are generally assessed through physical benchmarks; however, individuals with comparable tissue injuries who undergo comparable physical therapy regimes experience varying recovery times. The current paper assesses whether anxiety, depression, and self-efficacy account for such variations. A critical analysis of relevant research with quantitative data extraction was carried out using 24 peer-reviewed articles written between 2022 and 2026, including research focused on arthroplasty of the knee and hip, anterior cruciate ligament reconstruction (ACLR), and fractures of the lower limb. Effect estimates presented in the reviewed articles were recorded verbatim and, where possible, converted into equivalent derived measures (shared variance, per 10-point odds ratios, risk ratios). Psychological morbidity was common: the prevalence varied from 17% to 43% in case of depressive symptoms/diagnoses and from 21% to 36% in case of anxiety. The state anxiety, depressive symptoms, and low self-efficacy were consistently linked to poorer outcomes in terms of self-reported pain, function, and acceptable symptom state, showing bivariate correlations in primary studies in small-to-moderate sample sizes ($|r| \approx 0.31$-0.57; 10-32% shared variance). Scores taken shortly after surgery predicted chronic pain a year later following fracture fixation more strongly than baseline scores. Correlations were less strong, and frequently not significant after adjustments, for objectively measured performance variables and clinical diagnoses of mental disorders, in meta-analyses. Cognitive-behavioural and theory-based physiotherapy interventions led to improvements in psychological preparedness, self-efficacy and function, in randomised and quasi-experimental trials. There is support for systematic psychological screening and physiotherapy interventions that account for psychological issues, but the research base is limited to single-site observational cohorts with different measures.

Keywords: Anxiety; depression; self-efficacy; physiotherapy; orthopedic rehabilitation; total knee arthroplasty; anterior cruciate ligament reconstruction; fracture; psychologically informed practice.

1. Introduction

Among the conditions that result in referrals for physiotherapy are orthopedic injuries and the surgical procedures employed for treating them. The traditional medical model considers the joint, bone, or the graft as the relevant unit where tissue healing, recovery of range of motion and strength takes place and eventually leads to functionality. In reality, the process of recovery does not take such linear course as mentioned above. Two patients with identical patterns of fractures and identical knee prosthesis implanted by the same surgeon who have been enrolled in the same exercise program can differ greatly after a year in terms of their experience of pain, confidence, and involvement due to their psychological condition including anxiety, depression, and belief in their ability to execute behaviors demanded during rehabilitation.

1.1 Background

It is a big problem. The Global Burden of Disease Study has found that there were 595 million individuals (95% uncertainty interval 535-656 million) or 7.6% of the world's population affected by osteoarthritis in 2020, marking a 132.2% increase in the number of cases since 1990, and predicting the number of cases of knee osteoarthritis to increase by an additional 74.9% by 2050 (GBD 2021 Osteoarthritis Collaborators, 2023). In both cases, there is a growing demand for joint replacement and subsequent physiotherapy treatment. Sports injuries like ACL rupture and trauma-related fractures introduce another population group with the goal of returning to work and sport, where physiotherapy plays a vital role in recovery and requires consistent engagement from the patients over several months.

The psychological variables that have consistently been identified within the literature include anxiety, depression, and self-efficacy. Anxiety is perceived to influence an individual's heightened perception of danger and avoidance of movement. It may be assessed by measuring it as a state (situational anxiety), a trait, or pain-specific anxiety. Depression is perceived to decrease motivation and energy, resulting in the inability to engage in rigorous exercise,

as well as increase pain. Self-efficacy, a construct that is the level of confidence an individual possesses in performing a particular behavior, has been associated with continuing efforts despite the pain and slowness of rehabilitation.

1.2 Need of Research

There are three reasons that make this focused synthesis of the evidence highly necessary. First, the number of the publications has rapidly increased since 2022, yet these results are dispersed among journals on arthroplasty, sports medicine, and trauma, which seldom reference one another. Second, the results vary: some publications demonstrate the presence of significant correlations between psychological well-being and outcomes, but the 2026 meta-analysis showed that pre-surgical diagnosis of psychological disorders was not significantly associated with pain and functionality following knee surgery (Mehta et al., 2026). Clinicians should have an understanding of cases in which the psychological factors affect patient outcome and those in which they do not. Third, a few psychological-based physiotherapy programs have already been investigated in clinical trials, hence making it possible not only to assess the predictive value of psychological factors but also to influence them.

1.3 Motivation

This research project has been prompted by the following points:

- Psychological screening is relatively cheap compared to surgery and rehabilitation, but it does not form part of most physiotherapy regimes.
- In case anxiety, depression and self-efficacy determine outcome, then they can help identify people who could be assisted prior to an adverse outcome being reached.
- Unlike other demographic or surgical factors, self-efficacy is malleable depending on how physiotherapy is conducted.
- A common theoretical perspective will make findings from arthroplasty, ACL and trauma studies mutually informative.

1.4 Challenges

The investigation of psychological predictors of rehabilitation has certain methodological issues that need addressing:

- Multiple tools (HADS, STAI, GDS, PHQ-2, PROMIS, PSEQ, K-SES, SER among others) are used for the assessment of constructs of interest, thus precluding direct aggregation of measures.
- The temporal nature of psychological constructs requires consideration of measurement moments in addition to the constructs themselves.
- Outcomes include subjective self-report scores, objective test performance, and rate of sport activity resumption that might differ in sensitivity to psychological states.
- Mutual influences of pain, function, and mood make determination of the causal direction in observational data problematic.

1.5 Influencing Factors

The result of rehabilitation after an orthopedic injury depends on a number of groups of factors:

- Psychological factors – anxiety, depression, self-efficacy, fear of movement, pain catastrophizing, and resilience.
- Health care-related factors – injury type and severity, surgical intervention, pain prior to surgery, comorbidities, and functioning before injury.
- Social factors – perception of social support, family influence, and work or sports requirements.
- Demographic factors – age and gender, influencing psychological readiness after ACLR (Sell et al., 2024; Thorolfsson et al., 2023).
- Service-related factors – availability of physiotherapy and psychological approach to physiotherapy.

1.6 Conventional Approaches

Traditional rehabilitation programs are based on milestones. Advancement through the rehabilitation process depends on the amount of time elapsed since surgery, wound healing, joint mobility, strength symmetry, and functional testing. While these factors are crucial, they tell very little about why someone, despite meeting all the milestones, fails to get back into his or her sport, or why someone who feels a lot of pain at three months has almost no pain at twelve. The psychologically oriented approach to physiotherapy, where the cognitive-behavioral techniques are used by physiotherapists, has been suggested as an addition to traditional practice.

2. Literature Review

Literature from 2022 to 2026 was explored within four categories: anxiety, depression, self-efficacy, and psychological interventions. Table 1 provides an overview of the important studies.

2.1 Anxiety and Rehabilitation Outcome

Kalem et al. (2023) prospectively observed 188 adults aged 65 or over with intertrochanteric hip fractures fixed with intramedullary nailing. Bivariate correlation analysis showed that pre-operative STAI-State anxiety, GDS (depressive

symptoms), FES-I (fear of falls) and trait anxiety were associated with Harris Hip Score at 90 days, but multivariable logistic regression analysis revealed only STAI-State anxiety as an independent predictor of good result (Odds Ratio 0.92 per unit, 95% CI 0.86–0.99). For the knee arthroplasty, Aalders et al. (2025) performed a comparison of 349 patients according to HADS score and demonstrated that the patients with anxiety and/or depression had worse subjective function both pre- and post-operatively and were less likely to achieve the patient acceptable symptom state (PASS), although the proportion of patients achieving MCID was comparable. Yang et al. (2025) found that 36.0% of 89 total knee arthroplasty candidates suffered from clinically significant state anxiety and higher levels of pain and anxiety pre-operatively predicted lack of improvement after the pre-operative multidisciplinary programme.

2.2 Depression and Rehabilitation Outcome

Depression is a diagnosis which has received more attention in research than symptom scale. For community-dwelling older adults with hip fractures, Remelli et al. (2024) noted an almost threefold increase in the odds of ambulation problems after four months due to depression (OR 2.94, 95% CI 1.15–7.85), though the effect ceased to be statistically significant when pre-fracture ambulation was controlled (OR 2.11, 95% CI 0.75–6.04). After ACLR, Castle et al. (2025) established that the 25% of patients screening positive for mental health conditions with the help of two questions from the PHQ-2 questionnaire had significantly worse PROMIS scores for pain interference and physical function, had higher complication rates (34.4% vs. 9.5%) and underwent reoperations more frequently (21.9% vs. 4.2%). For patients with lower-extremity orthopedic trauma, Peairs et al.'s (2024) scoping review based on 12 articles showed that 83% of articles indicated worse outcomes among patients with pre-operative mental health problems, especially anxiety and depression. Mehta et al.'s (2026) meta-analysis, however, based on 53 eligible papers did not show any statistically significant associations between pre-operative mental health problems and pain/functionality scores six or twelve months after TKA.

2.3 Self-Efficacy and Rehabilitation Outcome

Self-efficacy has been assessed using condition-specific tools. In 30 athletes following ACLR, Erickson et al. (2022) reported that three-month K-SES scores were correlated with six-month IKDC scores (r = 0.528), quadriceps strength (r = 0.465), and knee flexion excursion during running (r = 0.472). In a cohort of 691 young individuals, the paediatric group demonstrated higher K-SES and ACL-RSI scores and greater sport return rates compared to the adolescents and young adults groups (Thorolfsson et al., 2023). Early pain self-efficacy predicted chronic pain in patients undergoing lower-extremity fracture fixation at 12 months (Van Wyngaarden et al., 2022). In arthroplasty patients, rehabilitation self-efficacy fully mediated the relationship between perceived social support and exercise adherence (Xu et al., 2024), whereas high pain self-efficacy was related to low NSAID consumption in the postoperative period three months following bilateral TKA (Sonobe et al., 2025).

2.4 Psychologically Informed Interventions

Several trials have examined the efficacy of modifying these variables. A randomised controlled trial (RCT) evaluating the effects of cognitive-behavioural physical therapy (CBPT) after anterior cruciate ligament reconstruction (ACLR) increased psychological preparedness, Lysholm knee score, and resilience compared with controls (Sun et al., 2025). The Toolkit for Optimal Recovery (TOR), a brief mind-body intervention for individuals who have suffered a traumatic orthopaedic injury, increased physical functioning in an RCT involving 195 participants, and this intervention effect was partially mediated by a decrease in pain catastrophizing and pain anxiety (Gnall et al., 2025). Meta-analysis of seven RCTs (608 patients) showed that cognitive-behavioural therapy after total knee arthroplasty decreased kinesiophobia during early postoperative period (mean difference −6.35, 95% CI −7.98 to −4.72; Liu et al., 2024), while a quasi-experimental study evaluated an exercise training program based on the health action process approach and its impact on rehabilitation self-efficacy and function after TKA (Zhou et al., 2026).

Table 1: Literature Review Matrix of Key Studies (2022–2026)

Author (Year)	Design / Sample	Predictor(s)	Key Finding
Kalem et al. (2023)	Prospective cohort; n = 188, hip fracture, age > 65	STAI, GDS, FES-I	Only state anxiety independently predicted 90-day good outcome (OR 0.92/point, 95% CI 0.86–0.99)
Remelli et al. (2024)	Cohort; n = 154, hip fracture	Depression (records/psychiatry)	OR 2.94 (1.15–7.85) for poor ambulation; 2.11 (0.75–6.04) after adjustment
Van Wyngaarden et al. (2022)	Prospective cohort; n = 114, lower-limb fracture ORIF	PROMIS depression, PSEQ, PCS, TSK	Scores from 6 weeks (not baseline) predicted 12-month chronic pain (45% prevalence)

Author (Year)	Design / Sample	Predictor(s)	Key Finding
Castle et al. (2025)	Retrospective cohort; n = 127, ACLR	PHQ-2	Positive screen: worse PROMIS/IKDC, complications 34.4% vs 9.5%, reoperation 21.9% vs 4.2%
Erickson et al. (2022)	Prospective cohort; n = 30, ACLR athletes	ACL-RSI, K-SES (3 months)	K-SES r = 0.528 with IKDC; both predicted 6-month IKDC (R^2 = 0.411)
Thorolfsson et al. (2023)	Registry cohort; n = 691, ACLR age 11–25	K-SES, ACL-RSI	Paediatric patients had higher self-efficacy and readiness and higher return to sport
Aalders et al. (2025)	Prospective comparative; n = 349, TKA	HADS	Anxiety/depression: worse subjective function and fewer reaching PASS; MCID attainment similar
Aalders et al. (2026)	Prospective; n = 289, TKA	HADS, PCS	Objective performance at 12 months largely unrelated after adjustment
Olsen et al. (2023)	Meta-analysis; 29 reports, 10,360 patients, TKA	61 factors	Catastrophizing r = 0.36 with 12-month pain; mental health r = −0.13 at 6 months
Mehta et al. (2026)	Meta-analysis; 53 articles, TKA	Mental health diagnoses	No significant association with pain or function at 6 months or ≥ 1 year
Xu et al. (2024)	Cross-sectional; n = 141, THA/TKA	Rehabilitation self-efficacy (SER)	Self-efficacy fully mediated social support → exercise adherence
Sun et al. (2025)	RCT; n = 61 analysed, ACLR	CBPT intervention	Higher ACL-RSI, Lysholm, and resilience vs control
Gnall et al. (2025)	RCT; n = 195, orthopedic trauma	TOR mind-body programme	Improved function, mediated by reduced catastrophizing and pain anxiety
Liu et al. (2024)	Meta-analysis; 7 RCTs, 608 patients, TKA	CBT	Early kinesiophobia WMD −6.35 (−7.98 to −4.72)

3. Research Gap and Problem Statement

The literature presented above demonstrates the connection between psychological variables and rehabilitation outcomes, but there are at least four issues limiting the ability of these studies to be applied to physiotherapy practice. First, the majority of papers focus on the impact of one variable on one group of patients. Comparing the impact of anxiety, depression, and self-efficacy in different injury types or comparing their impact in arthroplasty, ACL injuries, and traumas is rare. Second, the field lacks reconciliation of positive results obtained from cohort studies and negative results found via meta-analysis concerning diagnosed mental disorders. Third, the time of evaluation of the psychological state is usually not taken into consideration, although people's psychological condition varies throughout the recovery process. Fourth, there are no connections between predictor studies and intervention trials, and it is not clear which psychological predictors should be changed.

The main issue here is an insufficiently integrated understanding of what predictors, at what moment, and in what outcomes influence the success of physiotherapy after orthopedic injuries.

3.1 Research Objectives

- O1: Estimate the reported prevalence of anxiety, depression, and associated psychological morbidity among individuals undergoing orthopedic rehabilitation (2022-2026).
- O2: Synthesise the nature and strength of relationships between anxiety, depression, self-efficacy, and outcome.
- O3: Assess if there are differences between these relationships depending on type and time of assessment of outcome.
- O4: Review evidence regarding whether psychologically informed physiotherapy influences these variables and outcome.
- O5: Develop a theoretical framework for future practice and research.

4. Methodology

4.1 Research Design

The study utilized a systematic review with quantification of data from the articles reviewed. This approach was used due to the nature of the research questions being asked where one cannot use a meta-analysis due to the heterogeneity in the populations, instruments, and measures of the outcome variables studied. The process of reporting was guided by the guidelines of review reporting.

4.2 Eligibility Criteria and Sources

The selection criteria are listed in Table 2 below. Literature searches were conducted in October 2026, using search terms anxiety, depression, self-efficacy, kinesiophobia, psychological readiness, physiotherapy, rehabilitation, arthroplasty, anterior cruciate ligament, fracture, and orthopaedic trauma within the period 2022–2026. Bibliographic records were obtained from sources indexed on the internet (such as PubMed entries, Directory of Open Access Journals, institutional repositories), as well as publisher websites. Each entry selected was confirmed against the details provided on a publisher, indexing source, or repository website, to validate the authorship, year of publication, journal title, and extracted data.

Table 2: Eligibility Criteria and Extraction Framework

Element	Specification
Population	Adults or adolescents undergoing rehabilitation after orthopedic injury or orthopedic surgery (arthroplasty, ACL injury/reconstruction, fracture, orthopedic trauma)
Exposures	Anxiety (state, trait, pain-related, diagnosed), depression (symptoms, screens, diagnoses), self-efficacy (pain, knee, rehabilitation-specific); related constructs (kinesiophobia, catastrophizing, readiness) recorded as context
Outcomes	Patient-reported pain and function, objective physical performance, return to sport, acceptable symptom state, adherence, complications
Designs	Cohort, cross-sectional, RCT, quasi-experimental, systematic/scoping review, meta-analysis
Period / language	Published 2022–2026; English-language full text or abstract
Exclusions	Non-orthopedic populations; spine and upper-limb-only studies; conference abstracts without peer-reviewed publication; records whose bibliographic details or results could not be verified
Extraction items	Design, country, n, population, instruments, timing, effect estimates (OR, r, β, SMD, WMD, proportions) with 95% CI / p as reported
Derived indices	r^2 = shared variance; OR per 10 points = OR^{10}; crude risk ratio = p_1/p_2; mean differences by subtraction (all labelled as author's calculation)

4.3 Data Extraction and Derived Indices

The information extracted from each of the references included the design of the study, setting, sample size, population, psychological measures used, outcome measures used, time frame, and effect estimate with confidence interval or p-value as provided in the papers. Three transformations were made in order to facilitate comparability of associations between studies. First, correlation coefficients were converted to the shared variance (r^2). Second, odds ratios were adjusted on the per-point basis to the odds ratio on the basis of 10 points, that is, OR^{10}, assuming the log-linear model. Third, when group proportions were given, the risk ratio was computed as the ratio of proportions.

4.4 Appraisal and Synthesis

Criteria of appraisal for each source included design, sample size, control for confounding factors and blinding (for randomized controlled trials). Findings were summarized according to construct and outcome categories and the overall strength of evidence for the relationship between each predictor and outcome was quantified as strong, moderate, limited, or inconsistent using criteria inspired by the GRADE domains of risk of bias, inconsistency,

imprecision, and indirectness. The levels of evidence listed in Table 6 are the judgment of the author and the rationale for the judgment is provided below.

4.5 Proposed Conceptual Framework

The conceptual framework used for organizing the systematic review synthesis is shown in Figure 1. Anxiety, depression, and self-efficacy are considered as the predictors that exert their influence on rehabilitation outcomes via three mediators: fear of movement, pain catastrophizing and exercise adherence or engagement. Outcomes include pain and function measured by patients, physical performance and participation outcomes, which are return to sport and satisfactory symptom status. Moderators include type of injury, timing of injury, demographic characteristics, social support, and type of physiotherapy.

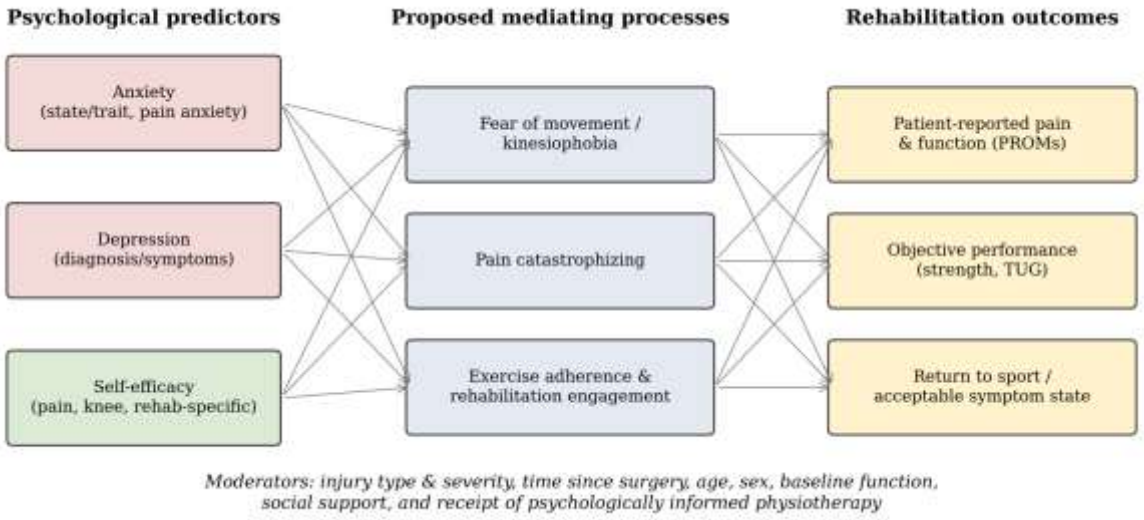


Figure 1: Proposed conceptual framework linking psychological predictors, mediating processes, and rehabilitation outcomes (developed by the author from the reviewed literature)

5. Results

5.1 Characteristics of the Evidence Base

A total of twenty-four papers fulfilled the eligibility criteria. Seven were systematic, scoping, or meta-analytical reviews; three were intervention studies (two RCTs and one quasi-experimental study); eleven were cohort studies; and three were cross-sectional studies or baseline studies. According to the populations, eleven were on hip or knee arthroplasty, six were on ACL injuries or reconstructions, and seven were on fractures or orthopedic trauma. The papers were from the USA, Netherlands, Italy, Turkey, Sweden, China, Japan, South Korea, and Malaysia. In the primary papers, the sample size varied from 30 patients (Erickson et al., 2022) to 691 patients (Thorolfsson et al., 2023), whereas the largest review had a sample size of 4,039 patients (Du et al., 2025).

5.2 Prevalence of Psychological Morbidity

Figure 2 displays the prevalence rates provided in various studies. In a multisite trial of 181 adults who suffered from a recent orthopedic injury, 34.3% were diagnosed with depression, 35.4% with anxiety, and 8.3% with post-traumatic stress disorder (PTSD), their mean score for physical function on PROMIS scale equaling 30.3 points, which is about two standard deviations below the mean in the general population, whereas only 31.5% underwent physiotherapy treatment (Hooker et al., 2024). In a group of 240 patients in Malaysia who sustained a trauma, 43.3% had depressive symptoms and 12.9% likely PTSD, and in 93.5% of cases when PTSD was identified, depressive symptoms coexisted (Zairul-Nizam et al., 2024). The lowest values were found in elective TKA (anxiety 21%, depression 17%; Aalders et al., 2026). Pooled prevalence of kinesiophobia after TKA surgery was found to be 35% (95% CI 27–44%) in 11 studies (Du et al., 2025). Cohorts of trauma recruited due to high pain catastrophizing or pain

anxiety (Hooker et al., 2024) do not represent all patients, hence these numbers reflect ranges, not population estimate.

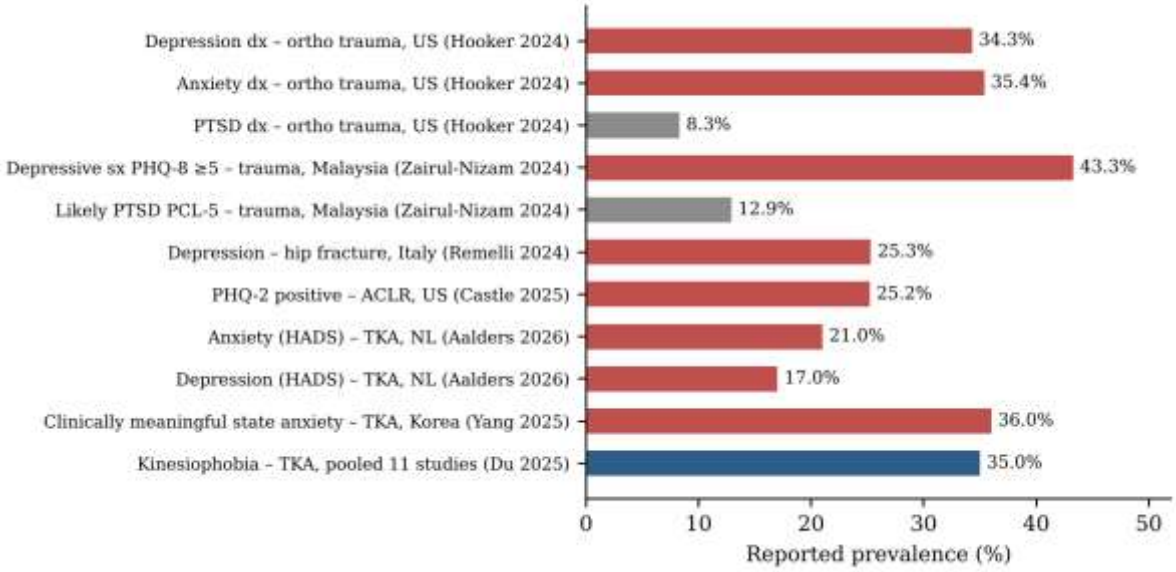


Figure 2: Reported prevalence of psychological morbidity in orthopedic rehabilitation cohorts, 2022–2026. Values are as reported in each source except Castle et al. (2025), calculated by the author as 32/127 PHQ-2-positive patients. Definitions and instruments differ across studies.

5.3 Anxiety as a Predictor

Summary of findings related to anxiety and depression is provided in Table 3. The only independent predictor of good 90-day outcome among the anxiety and depression variables was state anxiety assessed on the day of hip fracture surgery (Kalem et al., 2023). Re-scaled into 10 point difference in the STAI-state scale, the reported OR of 0.92 per point (Kalem et al., 2023) corresponds to an OR of 0.43 (calculated by the author) meaning that a 10 points higher score was associated with less than half odds of a good outcome. Bivariate correlation between state anxiety and HHS (r = -0.317) is equal to approximately 10% shared variance (Figure 3). State anxiety predicted worse subjective function and PASS scores in TKA surgery (Aalders et al., 2025). However, controlling for covariates (age, sex, ASA class, BMI, approach, and baseline scores) state anxiety was not significantly associated with the majority of objective outcomes at 12 months except flexion strength (p = 0.033; Aalders et al., 2026).

5.4 Depression as a Predictor

The existence of depression required definition and outcome measures. Depression symptoms and screening scales were consistently linked with poor outcome in all cases: six-, three- and six-month post-fracture fixation measures of PROMIS depression scale predicted chronic pain at 12 months (see Figure 4), while baseline values of the scale did not (Van Wyngaarden et al., 2022). The odds ratio per point at six weeks, 1.10, is equivalent to odds ratio of about 2.59 per 10-point difference (author's calculations). In addition, the odds ratios of complication and re-operation after ACLR in patients with PHQ-2-positive depression were equal to 3.6 and 5.2, respectively (author's calculations based on Castle et al., 2025). At 12 months only 42.9% of PHQ-2-positive subjects reached an acceptable level of symptoms compared with 79.5%. However, the effect of pre-operative mental health conditions, meta-analysed in TKA, showed no statistical significance in standardized mean differences of pain and function at six and 12 months or longer (Mehta et al., 2026). Olsen et al. (2023) similarly found only a small pooled correlation between better mental health and less pain at six months after TKA (r = −0.13, 95% CI −0.24 to −0.02), compared with a moderate correlation for pain catastrophizing at 12 months (r = 0.36, 95% CI 0.24–0.47).

Table 3: Reported Associations of Anxiety and Depression With Rehabilitation Outcomes

Source	Predictor	Outcome / timing	Reported estimate	Derived index*
Kalem et al. (2023)	STAI-state (pre-op)	Harris Hip Score ≥ 70, 90 days	OR 0.92 (0.86–0.99); r = −0.317	OR per 10 pts ≈ 0.43; r^2 = 10.0%
Kalem et al. (2023)	GDS (pre-op)	Harris Hip Score, 90 days	r = −0.311; OR 1.06, p = .290 (adjusted)	r^2 = 9.7%

Source	Predictor	Outcome / timing	Reported estimate	Derived index*
Van Wyngaarden et al. (2022)	PROMIS depression, 6 wk	Chronic pain, 12 months	OR 1.10 (1.04–1.16)	OR per 10 pts ≈ 2.59
Remelli et al. (2024)	Depression	Poor ambulation (CAS < 4), 4 months	OR 2.94 (1.15–7.85); adj. 2.11 (0.75–6.04)	—
Castle et al. (2025)	PHQ-2 positive	Complications / reoperation	34.4% vs 9.5%; 21.9% vs 4.2%	RR ≈ 3.62; RR ≈ 5.21
Castle et al. (2025)	PHQ-2 positive	PASS at 12 months	42.9% vs 79.5% (p = .009)	Difference 36.6 points
Aalders et al. (2025)	HADS anxiety/depression	Subjective function, PASS	Worse (all p < .05); MCID similar (p > .060)	—
Aalders et al. (2026)	HADS anxiety/depression	Objective performance, 12 months	Not significant after adjustment, except flexion strength (anxiety, p = .033)	—
Olsen et al. (2023)	Better mental health	Pain, 6 months (pooled)	r = −0.13 (−0.24 to −0.02)	r^2 = 1.7%
Mehta et al. (2026)	Mental health diagnosis	Pain / function, 6 months & ≥ 1 year	SMDs not significant (p = .07–.32)	—

Note. *Author's calculations from reported values; OR rescaling assumes log-linearity; crude RRs are unadjusted. 95% CIs in parentheses.

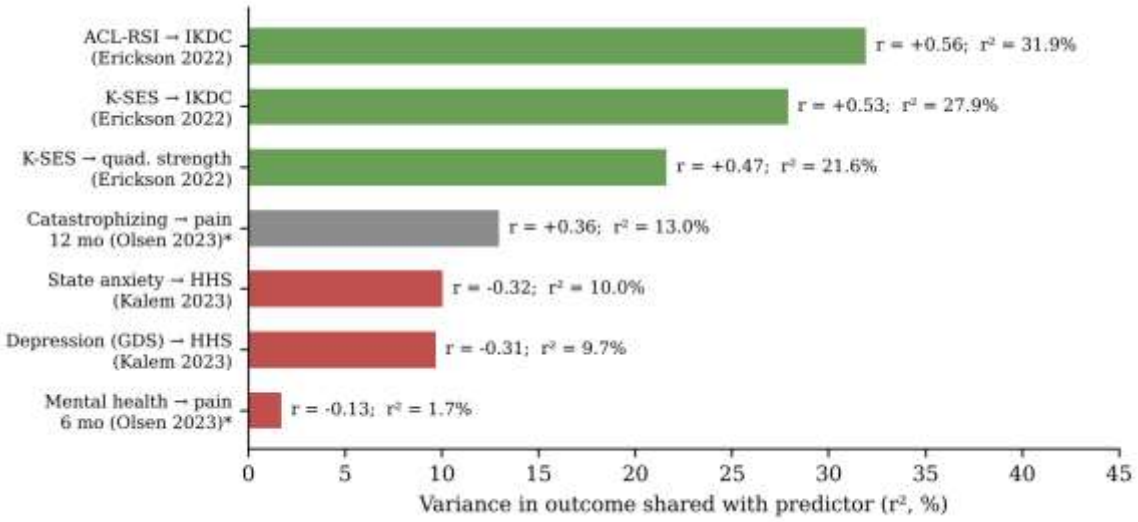


Figure 3: Size of reported bivariate associations between psychological predictors and rehabilitation outcomes, expressed as shared variance (r^2, author's calculation from reported r). Green = self-efficacy and readiness; red = anxiety, depression, and mental health; grey = related construct. *Pooled meta-analytic estimates.

5.5 Self-Efficacy as a Predictor

Table 4 provides an overview of the self-efficacy evidence. The highest correlation of self-efficacy with readiness measured shortly following ACLR: K-SES and ACL-RSI with IKDC scores at six months showed a 28% and 32% overlap in variance, respectively, while together explaining 41.1% of variance (Erickson et al., 2022). Given the sample size of 30 athletes, the above estimates could be imprecise. Pain self-efficacy measured at six weeks, three months, and six months after the surgery was predictive of chronic pain at 12 months, with the linear model predicting higher pain self-efficacy at six weeks being negatively associated with 12-month pain intensity (β = −0.06, 95% CI −0.09 to −0.04; Van Wyngaarden et al., 2022). In the case of arthroplasty, rehabilitation self-efficacy accounted for

approximately 55% of the total social support effect on exercise adherence (indirect effect 0.033 of a total effect of 0.060; author's calculation from Xu et al., 2024). In the kinesiophobia pooled analysis, low self-efficacy was not a statistically significant factor (OR 0.835, 95% CI 0.663–1.008), although it was one of the influencing factors (Du et al., 2025).

Table 4: Reported Associations of Self-Efficacy With Rehabilitation Outcomes

Source	Measure / timing	Outcome	Reported estimate	Derived index*
Erickson et al. (2022)	K-SES, 3 months	IKDC, 6 months	r = 0.528 (p = .003)	r^2 = 27.9%
Erickson et al. (2022)	K-SES, 3 months	Quadriceps strength	r = 0.465 (p = .010)	r^2 = 21.6%
Erickson et al. (2022)	ACL-RSI + K-SES	IKDC, 6 months	R^2 = 0.411 (p = .001)	—
Van Wyngaarden et al. (2022)	PSEQ, 6 weeks	Pain intensity, 12 months	β = −0.06 (−0.09 to −0.04)	—
Xu et al. (2024)	SER (mediator)	Exercise adherence	Indirect 0.033 (0.017–0.058); total 0.060	≈ 55% mediated
Sonobe et al. (2025)	High pain self-efficacy	NSAID use, 3 / 6 months	β = −0.27 (−0.51 to −0.01); 6 months n.s.	—
Thorolfsson et al. (2023)	K-SES, 8 & 12 months	Return to sport	Higher K-SES in paediatric group; RTS 90% vs 71% vs 62% at 12 months	—
Du et al. (2025)	Low self-efficacy	Kinesiophobia after TKA	OR 0.835 (0.663–1.008)	Not significant

Note. *Author's calculations from reported values. n.s. = not statistically significant.

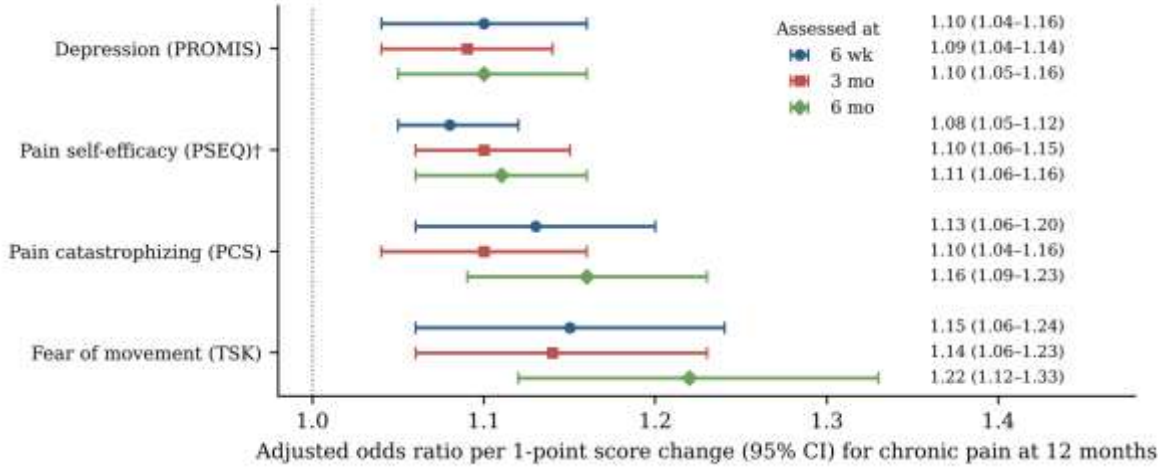


Figure 4: Adjusted odds ratios for chronic pain 12 months after lower-extremity fracture fixation by psychosocial score and time of assessment (data from Van Wyngaarden et al., 2022; models adjusted for injury severity, smoking, education, and BMI). †The source reports an OR above 1 for the PSEQ while its linear model shows higher self-efficacy associated with lower pain; this pattern is consistent with the OR being expressed per point of lower self-efficacy, but readers should consult the original coding.

5.6 Psychological Readiness and Intervention Effects

According to Figure 5a, psychological readiness after ACLR is characterized by a growing trend: pooled ACL-RSI scores were 44.4 prior to surgery, 61.5 for three to six months, and 70.7 for two to five years, along with extremely high heterogeneity (I^2 = 94–98%) and 78% of the 83 analyzed studies being at high risk of bias (Sell et al., 2024).

Early surgery time, male gender, and older age correlated with higher scores in the case of three to six months. Moreover, according to a systematic review of 38 studies, kinesiophobia and fear of reinjury were common outcomes after ACLR and could hinder return to sports (Nedder et al., 2024). In this regard, CBPT increased ACL-RSI by 4.2, 5.9, and 5.0 points compared to control at 6, 12, and 24 weeks (Figure 5b) and by 11.0 points Lysholm compared to control at 24 weeks, surpassing the 10-point MCID (author's subtraction from Sun et al., 2025). However, kinesiophobia (TSK) and present knee self-efficacy (K-SES) scores were similar between the groups in this study. Table 5 provides an overview of the intervention evidence.

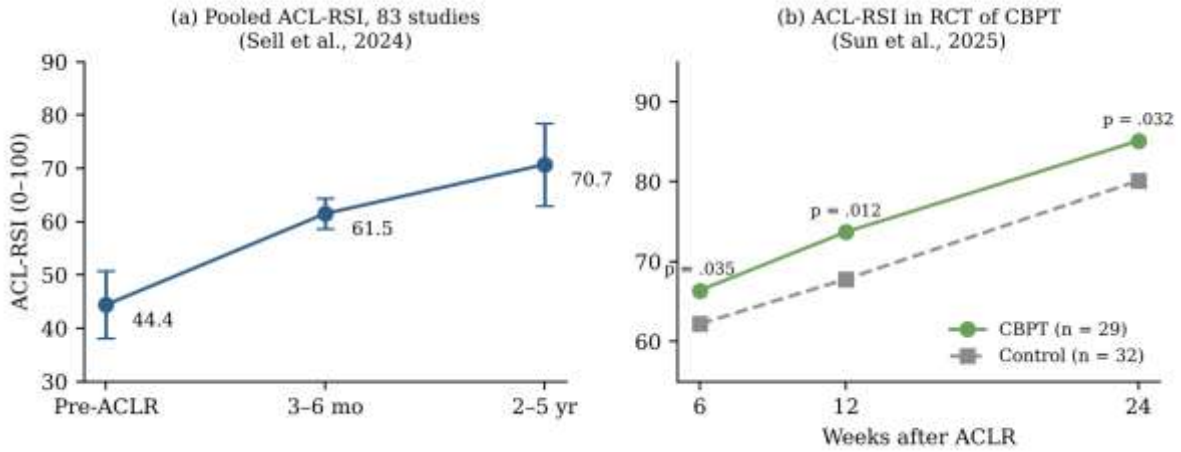


Figure 5: (a) Pooled ACL-RSI scores with 95% CIs over time after ACLR (Sell et al., 2024); (b) ACL-RSI scores in the cognitive-behavioural physical therapy (CBPT) and control arms of an RCT (Sun et al., 2025), with between-group p-values as reported.

Table 5: Psychologically Informed Interventions in Orthopedic Rehabilitation

Source	Design / n	Intervention vs comparator	Main reported effects
Sun et al. (2025)	RCT; 72 randomised, 61 analysed; ACLR	Cognitive-behavioural physical therapy vs control	ACL-RSI higher at 6, 12, 24 weeks (p = .035, .012, .032); Lysholm 83.2 vs 72.2 at 24 weeks (p < .001); resilience higher; TSK and K-SES n.s.
Gnall et al. (2025)	RCT; n = 195; orthopedic trauma	Toolkit for Optimal Recovery vs minimally enhanced usual care	Improved SMFA physical function; effect mediated by reductions in pain catastrophizing and pain anxiety
Liu et al. (2024)	Meta-analysis; 7 RCTs, 608 patients; TKA	CBT vs usual care	Early kinesiophobia WMD −6.35 (−7.98 to −4.72)
Zhou et al. (2026)	Quasi-experimental; 80 analysed; TKA	HAPA-based 3-month exercise programme vs routine care	Higher self-efficacy (SER) at 3 months (adj. p = .006); higher HSS; lower NRS and WOMAC; non-randomised, unblinded
Yang et al. (2025)	Retrospective pre–post; n = 89; TKA	Pre-operative multidisciplinary education	STAI-X 46.5 → 37.4; clinically meaningful anxiety 36.0% → 14.6% (both p < .001); no control group

5.7 Integrated Strength of Evidence

Table 6 summarizes the results. Post-operative symptom-level depression and poor pain self-efficacy have the strongest consistency with persistent pain, while state anxiety and depressive symptoms are consistently associated

with poorer functioning. There is conflicting evidence for the effect of diagnosed mental illness on outcomes after TKA, as well as for the predictive power of any of the three constructs for physical performance.

Table 6: Strength of Evidence by Predictor and Outcome (Author's Appraisal)

Predictor	Outcome	Strength	Basis
Depressive symptoms (post-op)	Persistent pain	Moderate	Consistent adjusted ORs at three time points; single-centre cohort
State anxiety	Patient-reported function	Moderate	Two cohorts (hip fracture, TKA) consistent; modest effect
Depression screen / symptoms	Function, complications, PASS (ACLR)	Limited	Single retrospective cohort; crude comparisons
Diagnosed mental disorder	Pain / function after TKA	Inconsistent	Meta-analysis null; scoping review mostly positive; definitions vary
Anxiety / depression	Objective performance	Limited	Associations largely disappear after adjustment
Self-efficacy (knee, pain)	PROMs, pain, strength	Moderate	Consistent direction across ACLR, fracture, TKA; small samples
Self-efficacy	Exercise adherence	Limited	Cross-sectional mediation only
Psychologically informed physiotherapy	Readiness, function, kinesiophobia	Moderate	Two RCTs and a meta-analysis consistent; short follow-up

Note. Grades are the author's judgments informed by GRADE domains (risk of bias, inconsistency, imprecision, indirectness); they are not formal GRADE ratings.

6. Discussion

6.1 Interpretation of Findings

However, the synthesis demonstrates that the clinical significance of anxiety, depression, and self-efficacy in predicting the outcome of physiotherapy after orthopedic injury is conditional and dependent on three factors. First, it depends on the timing of measurement. In the fracture group described by Van Wyngaarden et al. (2022), baseline psychosocial scores were not related to the development of chronic pain, while those measured from six weeks onwards were. Thus, it can be assumed that what really matters for prognosis is how a patient reacts psychologically to the early period of rehabilitation and not how he was at the moment of injury, which requires re-screening during rehabilitation.

Second, it depends on how the predictor itself is measured. Symptom scales and brief screens (STAI-state, PROMIS depression, PHQ-2) showed an association with outcomes, while mental disorders combined from heterogeneous TKA studies did not (Mehta et al., 2026). This may be because diagnoses recorded in medical records reflect past or treated diagnoses, while symptom scales reflect the current state that affects participation in rehabilitation. Remelli et al. (2024), who defined depression from records, medication, and psychiatric assessment, found an association that did not survive adjustment for pre-fracture mobility, which is consistent with this explanation.

6.2 Divergence Between Subjective and Objective Outcomes

The third one relates to the nature of the outcome. In the same Dutch TKA program, anxiety and depression have been found to correlate with poorer patient-reported levels of pain, function and attainment of PASS (Aalders et al., 2025), whereas after adjustment for confounders they have been found to be mostly unrelated to objective levels of strength, range of motion and Timed Up and Go test (Aalders et al., 2026). This difference may have two interpretations. One is that psychological distress affects perception and patient-reporting of recovery more than the physical capability. The other interpretation is that patient-reported variables measure some dimensions of recovery, such as patient's confidence in use of his knee, which are not being measured by performance tests. Either way, the results demonstrate that one cannot simply equate patient-reported scores and performance-based tests, and that psychological distress should be taken into account when patient-reporting of function is much worse than actual capacity.

6.3 Self-Efficacy as a Modifiable Mechanism

The most significant relationships were found in the case of self-efficacy, which was related to subjective and objective outcomes following ACLR (Erickson et al., 2022). Furthermore, self-efficacy mediated the relationship between social support and adherence to physical activity (Xu et al., 2024) and theory-based interventions helped

to enhance it (Zhou et al., 2026). This is in line with the idea that self-efficacy acts through adherence in one of the paths presented in Figure 1. At the same time, self-efficacy is important for clinical practice since it is formed in the process of the physiotherapy session as a result of graded experiences of mastery, explanations and feedback on the progress. The results that show that CBPT can improve the level of readiness and knee function without influencing the K-SES (Sun et al., 2025) suggest, however, that the mechanisms remain unclear.

6.4 Implications for Practice

- Screen early and repeat: brief screens (PHQ-2, STAI-state or HADS, PSEQ or K-SES) can be administered again after six weeks and three months, where they are most predictive.
- Assess change from an MCID perspective: for HADS in arthroplasty patients, distribution-based MCIDs of approximately 1.2–3.8 (anxiety) and 1.1–3.6 points (depression) have been documented for TKA (de Filippis et al., 2023).
- Work collaboratively rather than referring: psychologically-oriented physiotherapy (CBPT, TOT-type interventions, HAPA-inspired physical activity) has resulted in better motivation, function, and self-efficacy among patients in trials.
- Referral is necessary: where there is a high level of depressive or PTSD symptoms among trauma patients (Hooker et al., 2024; Zairul-Nizam et al., 2024), referral to mental health specialists is necessary rather than treatment in physiotherapy alone.

6.5 Limitations

Limitations of this review are numerous. Since it was performed by one reviewer with the help of web-based indexing only without the use of protocol and thorough database searches and duplication checking, possible relevant studies could be overlooked. Information was gathered solely from publisher/index/repository websites. Confidence intervals or full author list, when unavailable, are indicated as such, rather than assumed. Due to lack of homogeneity among the measures and outcomes, no meta-analysis could be done. The derived indices of association (r^2, adjusted for log-linearity ORs, crude risk ratio) assume certain factors, including lack of adjustment. Since most of the primary studies were done as single-center studies and observational studies, causality of reported associations cannot be drawn due to the possibility of reverse causation – poor physical recovery causing anxiety and mood disturbances.

7. Conclusion

As can be seen from the above review, anxiety, depression, and self-efficacy can be considered common, quantifiable, and prognostic factors in rehabilitation following injury and surgery to bones. Clinically significant levels of state anxiety and depressive symptoms occurred in the range of about one in six to two in five patients in the most recent samples. State anxiety and depressive symptoms were correlated with lower scores for patient reported pain and function, as well as with low self-efficacy, especially as measured during the first few weeks following the operation. Such correlations were stronger for patient reported results and symptom measures performed in the process of rehabilitation and either weaker or nonexistent for performance and diagnosis results. As follows from the studies performed on psycho-informed physiotherapy, psychological preparedness, self-efficacy and function can be enhanced. The practical conclusion drawn from these findings is that psychological evaluation should become a part of physiotherapy protocol.

8. Future Scope

Future work will have to focus on filling in these gaps. Cohort studies at multiple centres utilising a common core set of measures (PHQ-9, GAD-7 or HADS, PSEQ or condition-specific self-efficacy, and PROMs as well as performance measures) will make comparisons across arthroplasty, ACL, and trauma groups possible, thus facilitating an individual patient meta-analysis. A repeated-measures study design, possibly employing cross-lagged analysis or mediation analysis, is required for establishing causality and testing the hypothesised pathways described above (Fig. 1). Well-powered clinical trials should provide the measures of psychological mediators along with physical ones for identifying active ingredients of physiotherapy. Studies from low- and middle-income countries (like India), as well as those from high-income countries featured in this review, will be required.

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