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The influence of cognitions, emotions and behavioral factors on treatment outcomes in musculoskeletal shoulder pain: a systematic review

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ABSTRACT

Objective: To examine the predictive, moderating and mediating role of cognitive, emotional and behavioral factors on pain and disability following shoulder treatment.

Data Sources: Electronic databases (Pubmed, Web of Science, Embase, PsycINFO) were searched until the 14th of January 2019.

Study selection: Studies including persons with musculoskeletal shoulder pain that describe the predictive, moderating or mediating role of baseline cognitive, emotional or behavioral factors on pain or disability following treatment were selected.

Results: Twenty-three articles, describing 21 studies and involving 3769 participants, were included. Three studies had a high risk of bias. There was no predictive role of baseline depression, anxiety, coping, somatisation or distress on pain or disability across types of shoulder treatment. No predictive role of fear-avoidance beliefs was identified in patients receiving physiotherapy, which contrasted to the results found when surgical treatment was applied. Baseline catastrophizing was also not predictive for pain or disability in patients receiving physiotherapy. After conservative medical treatments, results on the predictive role of catastrophizing were inconclusive. Treatment expectations and baseline self-efficacy predicted pain and disability in patients receiving physiotherapy, which was not the case in patients receiving conservative medical treatment. Finally, there was a moderating role for optimism in the relationship between pain catastrophizing and disability in patients receiving physiotherapy.

Conclusion: There is evidence that expectations of recovery and self-efficacy have a predictive role and optimism a moderating role on pain and/or disability following physiotherapy for musculoskeletal shoulder pain. After surgical treatment, fear-avoidance is a predictor of pain and disability.

Keywords: Shoulder; treatment outcome; pain; psychological factor

INTRODUCTION

With a one year prevalence of 31% in the general population, shoulder pain is one of the most common musculoskeletal complaints.[1] It hampers proper movement of the upper limb and negatively affects daily activity performance and daily life autonomy.[2-4] Only 21 to 50 percent of patients with shoulder pain treated in primary health care recovers within six months after treatment start.[5-7] Percentages of recovery are slightly higher after physiotherapy, with 60% of patients being recovered at 6 months.[8] These figures clearly indicate that current treatments are failing for a large group of patients.

A potential reason for these rather disappointing results is that treatment mainly focuses on the painful or damaged tissue. However, shoulder complaints regularly outlast the time that damaged tissue needs for recovery,[9] and the severity of local tissue damage is not related to perceived shoulder pain.[10] This suggests that current interventions are not optimal or that persistent pain cannot be simply related to tissue damage alone.

Psychological factors can influence treatment outcome for patients with various musculoskeletal problems, such as chronic low back pain or tendinopathy,[11, 12] or for competitive athletes with sports injuries.[13] Although psychological factors are clearly associated with shoulder pain,[14] the role of psychological factors as contributors to the outcome of treatment for shoulder pain has not been systematically reviewed. This information is essential since psychological factors that influence treatment outcome might induce a vicious circle of maladaptive emotions, cognitions or behaviors when left untreated, leading to suboptimal outcomes from standard therapy for shoulder pain.

Influencing psychological factors can be defined as predictive, mediating or moderating factors for treatment outcome. A predictive factor is a variable that predicts and explains changes in the outcome. A moderating factor influences the relationship between a predictor and an outcome, and measures the strength of the relation. A mediating factor on the other hand explains the relationship between a predictor and an outcome, i.e. when the mediator is removed, the relationship between the predictor and outcome disappears.[15] The aim of this review was therefore to systematically describe the available knowledge on the predictive, moderating and mediating role of cognitions, emotions and behavioral factors on pain and disability following shoulder treatment. Identification of these factors is imperative to optimize treatment and its outcomes.

METHODS

Protocol details were registered in the international prospective register of systematic reviews (PROSPERO, registration number RD42017071707). Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed.[16]

Papers were selected from PubMed, Web of Science, Embase and PsycINFO (until the 14th of January 2019), using a combination of search terms for the shoulder, type of disorder, intervention and cognitions, emotions and behavioral factors. The search terms and the used strategies can be found in Appendix 1 and 2.

Eligibility criteria are described in Table 1. Eligibility assessment was done in a blinded manner by two assessors (LDB and AT) by screening the title and abstract of all studies retrieved from the electronic database search. From all eligible studies based on title and abstract, and from those studies whose abstract did not provide enough information for eligibility, full texts were read to finally select the papers for inclusion. Reference lists of included papers were manually screened by both reviewers for additional eligible papers. In case of disagreement between the two assessors, a third assessor (TM) was contacted for consensus. Furthermore, experts were consulted to ensure that no relevant papers for inclusion were missed.

Risk of bias assessment of selected studies was done using the Quality In Prognosis Studies tool.[17] This tool includes questions related to six important domains to consider when evaluating risk of bias in studies of prognostic factors: participation, attrition, prognostic factor measurement, confounding measurement and account, outcome measurement and analysis and reporting. According to responses to items, risk of bias for each of the six domains was determined as high, moderate or low (high risk was scored 2 points, moderate risk 1 point and low risk 0 points). The overall risk of bias rating was determined based on the mean scores of the six domains per study. Mean scores from 0 to 0.65, from 0.66 to 1.32 and from 1.33 to 2 were considered low, moderate and high risk of bias respectively. The Quality In Prognosis Studies tool is recommended to assess risk of bias by the Cochrane Prognosis Methods Group for prognosis studies.[17]

Two reviewers (LDB and AT) independently rated the risk of bias of the included papers. Reviewers were blinded to each other's results. In case of disagreement between assessors, consensus was reached after discussion with a third reviewer (TM).

Following data was extracted from the included papers: (1) author, year of publication; (2) characteristics of the study population; (3) specifications on the received treatment; (4) primary treatment outcome(s); (5) assessed cognitions, emotions and behavioral factors; and (5) key findings related to the influence of assessed cognitions, emotions and behavioral factors on treatment outcome(s). Data was extracted by one person (LDB) and verified by a second person (AT).

No meta-analysis could be performed due to study-heterogeneity in study population, received treatment, assessed cognitions, emotions and behavioral factors. Therefore, a best-evidence synthesis was performed.

RESULTS

Our database search identified 2987 articles. The selection process is visualized in the flow-diagram in Figure 1. Based on the predefined eligibility criteria, a total of 23 papers, describing 21 studies, were included, with a total of 4078 participants.

Risk of bias results (per domain and overall risk of bias rating) for included studies are shown in Table 2. Nine studies had a low risk of bias, 11 studies had a moderate risk of bias. Three studies had high risk of bias.

Four studies specifically included patients with subacromial shoulder pain,[18-21] and in five studies persons with rotator cuff tears were assessed.[22-26] In 13 studies participants with mixed shoulder diagnoses were included.[27-39] One study included persons with osteoarthritis undergoing shoulder arthroplasty.[40]

In 12 studies, patients with any duration of shoulder pain participated.[18, 20, 22, 27-31, 34, 35, 37, 40] The other studies included patients with shoulder pain of less than three months,[33] less than six months,[32] at least one month,[21, 23] or at least three months.[19, 39]

All studies, except for the study of Coronado et al. (2017)[32] described a predictive model in which several multidimensional prognostic factors for the outcome of shoulder treatment were simultaneously considered,[18, 19, 23-25, 27-31, 33, 36, 39, 41] or in which the predictive value of a

particular psychological variable on suboptimal treatment outcome was assessed.[21, 22, 26, 34, 35, 37, 38, 40] One study additionally identified risk groups for persistent shoulder pain and disability.[28]

Postoperative symptoms of psychological disorders were added as independent variables to the prediction model in three papers.[24, 25, 35] In the other 20 papers, only the results of a baseline assessment of psychological factors were added to the prediction model.

With regard to moderating or mediating psychological factors, one study assessed the moderating influence of optimism on the relation between pain catastrophizing and fear-avoidance beliefs on the one hand and shoulder pain and disability on the other hand.[32]

Assessed cognitions, emotions and behavioral factors were anxiety and depression, distress, somatization, coping, self-efficacy, patient's expectation of recovery, optimism, fear-avoidance beliefs and pain catastrophizing. The assessment scales and questionnaires that were used, are specified in Table 3.

Disability and pain outcomes were assessed by the Shoulder Pain and Disability Index, the complete and short version of the Disabilities of the Arm, Shoulder and Hand questionnaire, the Function Subscale of the Pennsylvania Shoulder Score, the Shoulder Disability Questionnaire, the American Shoulder and Elbow Surgeons Shoulder Score, the Flexilevel Scale of Shoulder Function, the Simple Shoulder Test, the Western Ontario Rotator Cuff Index, the Brief Pain Inventory, and a Numeric Pain Rating Scale.

The applied treatment consisted of surgery in seven papers.[22, 24, 26, 35, 38-40] Physiotherapy without other medical interventions was applied in six papers.[21, 23, 25, 27-29] In two studies, a cohort receiving mixed treatments (surgical, nonsurgical medical or physiotherapy interventions) was assessed.[36, 37] In another seven studies, a cohort receiving mixed conservative treatments (nonsurgical medical and physiotherapy interventions) was included.[18-20, 30, 31, 33, 34]

Other study characteristics are described in greater detail in Table 3.

Results on the predictive role of psychological factors on pain and disability are summarized in Table 4. Ten studies could identify a predicting role of a psychological factor. Across all treatments, no predictive role of depression, anxiety, somatisation, distress or coping was identified.[18, 19, 22, 26, 27, 29, 31, 33-35, 39, 40] In the study of Thorpe et al. (2018) however, a predictive role for a psychological cluster consisting of depression, stress, anxiety, self-

efficacy, fear-avoidance beliefs and pain catastrophizing was revealed.[38] The predictive value of fear-avoidance beliefs, pain catastrophizing, self-efficacy and expectations of recovery was depended on treatment type. Baseline fear-avoidance results were predictive for pain and disability after surgical treatment,[24, 38, 39] but not after physiotherapy treatment.[21, 25] Also regarding pain catastrophizing, results indicated that catastrophizing was not predictive for the outcome after physiotherapy treatment.[21, 23] The results on the predictive value of pain catastrophizing on the outcome after mixed conservative treatments were furthermore inconsistent.[31, 34] In contrast, expectations of recovery and self-efficacy were predictors of pain and disability in cohorts receiving physiotherapy treatment.[27, 28] In persons receiving mixed treatments, results on the predictive value of expectation of recovery were conflicting.[20, 37 18, 36]

Regarding moderating psychological factors on pain or disability, Coronado et al. (2017) reported that baseline optimism moderated the relation between pain catastrophizing and shoulder disability following physiotherapy treatment, i.e. optimism decreased the negative influence of pain catastrophizing on shoulder disability.[32] On the contrary, optimism was not found to moderate the relation between pain catastrophizing and pain. Optimism was furthermore no moderator in the relation between fear-avoidance beliefs and disability or pain following physiotherapy treatment.[32]

DISCUSSION

This review indicates that there is no predictive value of fear-avoidance beliefs in patients receiving physiotherapy, which contrasts to the results found after surgical treatment. Regarding baseline catastrophizing, results show that baseline catastrophizing neither is predictive for pain or disability in patients receiving physiotherapy. There is a predictive role of treatment expectations and baseline self-efficacy in patients receiving physiotherapy, which is not consistently found after conservative medical treatment. Finally, there is a moderating role for optimism in the relationship between pain catastrophizing and disability in patients receiving physiotherapy.

The result that higher levels of *optimism* decreased the strength of the relation between pain catastrophizing and disability, is in line with research in other musculoskeletal complaints.

This research indicates that the relation between catastrophizing and treatment outcome is weaker in persons with positive personality traits such as hope or optimism, and higher in persons with negative personality traits, such as neuroticism or negative affect.[42-44]
The reported protective role of positive recovery *expectations* in this review on pain and disability in a physiotherapeutic setting is furthermore in line with available literature on the positive role of expectations for recovery in a broad range of healthcare problems.[45, 46] With regard to *self-efficacy*, evidence systematically suggests that higher self-efficacy levels are associated with lower levels of pain and disability in chronic musculoskeletal pain.[47, 48] In this systematic review, contradictory results were found regarding the role of self-efficacy in a medical versus physiotherapy setting. The physiotherapy treatment presumed the patient to actively participate in its rehabilitation program in the form of a home-based exercise program. In such a setting, where an active and independent patient involvement was required, a predictive role of self-efficacy was identified for a successful treatment outcome.[27] In this context, high levels of self-efficacy have already been recognized as an enabler for treatment adherence in a musculoskeletal physiotherapy setting.[49]
The results of this review regarding the predictive role of *fear avoidance beliefs* and *pain catastrophizing* on pain or disability also seem to be dependent on the applied type of treatment. Following surgery, baseline fear avoidance beliefs are predictive for outcome. Following physiotherapy treatment, no predictive role of baseline fear avoidance beliefs and catastrophizing is reported. This difference emphasizes the opportunity of physiotherapy to target maladaptive beliefs at treatment start in order to optimize treatment response.
With regard to *somatization, depression, anxiety, distress or coping*, no predictive role was identified in the papers included in this review, which is in contrast with available research in other musculoskeletal complaints.[50-52]

A potential reason why no or only a limited predictive value was found in the studies included in this review might be attributed to methodological issues like selection of participants. In the studies specifically aiming to identify the predictive value of a distinct psychological factor, only a low number of participants had deviating scores on these psychological factors. This non-specific recruitment with regard to baseline scores on these psychological factors, decreases the chance to find predictive associations between psychological factors and outcome.

A lack of construct validity of applied measurement tools might be another explanation why only a limited predictive value for some psychological factors was found. Depression and

anxiety were assessed using a study-specific scale that examined whether patients were not, moderately or extremely anxious and depressed in the previous seven days.[27] In another study, one item of the EQ-5D that asked a patient whether he/she felt not, a little, moderately, very or extremely anxious or depressed that day, was used.[53] These self-reported one-item questionnaires might have a low specificity to detect depression or anxiety.[54]

It is furthermore known that the relation between a psychological construct and pain or disability might be influenced by other psychological factors. Only one trial in this review investigated the moderating effect of a psychological variable (i.e. optimism) on the relation between another psychological variable (i.e. catastrophizing) and disability/pain.[32] The fact that no other studies included the analysis of potential moderating/mediating role might contribute to the fact that limited associations were found between psychological factors at baseline and treatment outcome.

Apart from three study,[24, 25, 35] no study included the assessment of cognitions, emotions or behavioral factors at follow-up in their prediction model. However, it is clear from cross-sectional research that fear-avoidance beliefs and catastrophizing are important predictors of reported disability.[21, 55, 56] It is possible that cognitions, emotions or behavioral factors change over time as a result of received treatment. In the trial of George et al. (2011), patients with high fear-avoidance beliefs reported larger improvements in pain intensity and function from therapy start to discharge. In their study, patients with elevated fear-avoidance received a patient-centered treatment plan, based on a biopsychosocial model, in which fear was addressed when it was detected.[57] These patients might have reported less fear-avoidance beliefs at discharge due to their specific treatment. In contrast, when these maladaptive beliefs are not targeted during treatment, they might not change or become worse at follow-up. Abovementioned is supported by the results of this review which indicate no predictive value of baseline fear-avoidance beliefs following physiotherapy treatment and a predictive value of baseline fear avoidance after surgical treatment. This means that research aiming to explain the extent to which cognitions, emotions or behavioral factors influence the outcome of treatment, should additionally include assessments of these factors at follow-up.

Apart from potential methodological limitations in the included studies, there might also have been limitation to the search used for this systematic review. Although a large search strategy in multiple databases was performed and experts were contacted, it is possible that relevant studies were not identified for this review.

The results of this review have implications for clinical practice. Better knowledge in healthcare workers about psychological predictors, moderators and mediators of outcome in shoulder pain may help to identify patients with good prognosis and patients at risk for long term disability. As such, a potential evolution toward chronicity can be prevented (e.g. targeting a low level of self-efficacy when treatment requires the performance of home-exercises to prevent poor treatment results, or targeting fear-avoidance behavior in patients undergoing surgery). This implicates that the assessment of these constructs should be part of the regular shoulder patient assessment in primary and physiotherapy care. Several screening measures are recently proposed that can support such a multidimensional examination, i.e. the modified version of the STarT Back Screening Tool,[58] a PSCEBSM model including the assessment of pain, and somatic, cognitive, emotional, behavioral, social and motivational factors,[59] or the OSPRO Yellow Flag Assessment Tool.[60]

Multidimensional biopsychosocial treatment that addresses physical and psychological factors related to perceived pain and disability is an effective treatment approach in chronic pain patients.[61-63] Patient education to expand patients' understanding regarding pathology, pain and influencers of pain and disability (e.g. psychological factors such expectation of recovery, self-efficacy, fear avoidance, pain catastrophizing by means of cognitive behavioral approach)[64, 65] seems essential as it is shown in recent qualitative studies that persons with shoulder pain believed that their pain was caused by structures local to the shoulder region.[66, 67] Appropriate physical activity interventions based on individual goal-setting and preferences, are furthermore suggested.[62, 68] Multidisciplinary treatment programs administered by healthcare professionals from different backgrounds, i.e. medical doctors, physical therapists and psychologists, can be provided. A recent systematic review and meta-analysis indicated moreover that psychological interventions delivered by physiotherapists were promising to improve psychological factors in musculoskeletal pain conditions.[63]
This review results also highlight potential future research paths. The potential protective role of positive traits (e.g. hope, optimism, resilience, self-efficacy and positive expectations) as predictors of pain and disability, or as moderators of the negative effect of emotional or cognitive factors (e.g. fear of pain or pain catastrophizing), should be further elaborated on in shoulder pain. To fully identify the impact of psychological factors on treatment outcome, future research should include the assessment of psychological factors at follow-up. Finally, to increase the power of the research that aims to detect associations between psychological

factors and pain or disability, patients with psychological risk factors should specifically be recruited.

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Table 1. Eligibility criteria

Inclusion criteria	Exclusion criteria
- Inclusion of adult participants with a primary musculoskeletal shoulder disorder - Description of a prospective cohort study or randomized controlled trial that reports the outcome(s) of any shoulder treatment - Treatment outcomes are pain and/or disability - The influence of emotional, cognitive and behavioral factors on treatment outcome is investigated* - At least a pre-intervention assessment of cognitions, emotions or behavioral factors is performed - Articles are peer-reviewed, in full-text available and written in English or Dutch language	- Retrospective designs - Studies without ethical approval and patient informed consent - Studies including participants with shoulder disorders secondary to other pathologies/treatments (e.g. breast cancer (treatment), stroke, cardiac surgery) - Studies including participants with shoulder disorders secondary to cervical, thoracic or other upper extremity disorders. - Studies that performed an analysis on a population with different upper extremity problem types (e.g. inclusion of persons with wrist pain and elbow pain and shoulder pain)

*: Influencing psychological factors are defined as predictive, mediating or moderating factors. To identify predictive factors, regression analysis is needed. To be identified as a moderating or mediating factor, the influence of the psychological factor on the relation between a predictor and an outcome should be analyzed.

Table 2. Risk of bias according to the QUIPS tool.

	1. Study Participation	2. Study Attrition	3. Prognostic Factor Measurement	4. Outcome Measurement	5. Study Confounding	6. Statistical Analysis and Reporting	Overal risk
Braun et al, 2018	Low risk	Low risk	Low risk	Low risk	Moderate risk	Low risk	LOW
Chester et al, 2016	Low risk	Low risk	Moderate risk	Low risk	Moderate risk	Low risk	LOW
Chester et al, 2019	Low risk	Low risk	Moderate risk	Low risk	Moderate risk	Low risk	LOW
Cho et al, 2015	Moderate risk	High risk	Moderate risk	Low risk	High risk	Low risk	MODERATE
Cho et al, 2015	Moderate risk	High risk	Moderate risk	Low risk	High risk	Low risk	MODERATE
Coronado et al., 2017	Moderate risk	High risk	Low risk	Low risk	High risk	Low risk	MODERATE
De Bruijn et al., 2007	Moderate risk	High risk	High risk	Low risk	High risk	Moderate risk	HIGH
Ekeberg et al, 2010	Low risk	Low risk	Low risk	Low risk	High risk	Low risk	LOW
Engebretsen et al., 2010	Low risk	High risk	Moderate risk	Moderate risk	Moderate risk	Low risk	MODERATE
Jain et al, 2018a	Moderate risk	Moderate risk	Moderate risk	Moderate risk	Moderate risk	Low risk	MODERATE
Jain et al, 2018b	Moderate risk	Moderate risk	Moderate risk	Moderate risk	Moderate risk	Low risk	MODERATE
Karel et al, 2017	Low risk	Moderate risk	Low risk	Low risk	Moderate risk	Low risk	LOW
Kennedy et al, 2006	Low risk	Low risk	Moderate risk	Low risk	Low risk	Low risk	LOW
Koorevaar et al, 2016	Moderate risk	High risk	Low risk	Low risk	Low risk	Low risk	LOW
Kromer et al, 2014	Moderate risk	Low risk	Low risk	Low risk	Moderate risk	Low risk	LOW
Kvalvaag et al, 2017	Low risk	High risk	Moderate risk	Moderate risk	Moderate risk	Low risk	MODERATE
Laslett et al, 2015	High risk	Moderate risk	High risk	Moderate risk	Moderate risk	High risk	HIGH
O'malley et al, 2004	High risk	High risk	High risk	Moderate risk	Moderate risk	Low risk	HIGH

Potter et al, 2015	Moderate risk	Moderate risk	Low risk	Low risk	High risk	Low risk	MODERATE
Reilingh et al, 2008	Low risk	High risk	Moderate risk	Low risk	Moderate risk	Low risk	MODERATE
Thorpe et al, 2018	Low risk	Moderate risk	Low risk	Low risk	Low risk	Low risk	LOW
Van der Windt et al, 2007	Moderate risk	High risk	Moderate risk	Low risk	Moderate risk	Low risk	MODERATE
Woollard et, 2017	Low risk	High risk	Low risk	Low risk	Moderate risk	Moderate risk	MODERATE

QUIPS tool: Quality In Prognosis Studies tool

Table 3. Characteristics of included studies

Author, year	Characteristics of study population (Number, sex, mean age (SD); type of shoulder pain)	Specifications on received treatment for shoulder pain	Primary treatment outcome(s) and assessment time points	Baseline psychological variables	Key findings related to psychological influence on outcome
PREDICITVE VALUE OF PSYCHOLOGICAL VARIABLE					
Braun et al., 2018	N=65 (M/F), 50(12) Patients with (local) shoulder pain in the presence of an atraumatic partial thickness tear Duration of shoulder pain at baseline ranged between 1 and 58 months	Physiotherapy including advice, education, exercises and manual therapy	Function and pain (Western Ontario Rotator Cuff Index) Assessment at baseline and at 3 months	Pain catastrophizing (PCS)	Baseline catastrophizing is not predictive of function at 3 months following physiotherapy treatment
Chester et al, 2016	N=1030 (M/F), 57(15) Shoulder pain of any duration due to overuse, trauma, unusual activity, no clear reason Mean duration of shoulder pain at baseline (months): 14 (28)	Physiotherapy, containing a home-exercise program	Upper extremity pain and disability (QuickDASH, SPADI) Assessment at baseline, at 6 weeks and at 6 months	Anxiety/Depression in previous 7 days (no, moderately, extremely) Self-efficacy (pain self-efficacy questionnaire) Patient's expectation of change (seven point global impression of change scale)	Higher pain self-efficacy and patient expectations of complete recovery as a result of physiotherapy, are associated with better outcomes on SPADI and QuickDASH, 6 weeks and 6 months after starting a course of physiotherapy
Chester et al., 2019	N=810 (M/F), 57(15) Shoulder pain of any duration due to overuse, trauma, unusual activity, no clear reason	Physiotherapy, containing a home-exercise program	Upper extremity pain and disability (QuickDASH, SPADI)	Anxiety/Depression in previous 7 days (no, moderately, extremely)	Patient expectation and pain self-efficacy are associated with pain and dysfunction at follow-up

	Mean duration of shoulder pain at baseline (months): 14 (28)		Assessment at baseline and at 6 months	Self-efficacy (pain self-efficacy questionnaire) Patient's expectation of change (seven point global impression of change scale)	
Cho et al, 2017	N=46 (M/F), 65.7 (10.1) Persons with osteoarthritis scheduled for total shoulder arthroplasty Mean duration of shoulder pain at baseline: 8.0 (9.8) years	Total shoulder arthroplasty	Pain severity (VAS) Function (ASES) Assessment at baseline, and at 12 months	Anxiety and depression (HADS)	Preoperative depression and anxiety are not predictive of poor postoperative outcome at 12 months
Cho et al, 2015	N=47 (M/F), 57 (8) Persons scheduled for rotator cuff repair Mean duration of shoulder pain at baseline: 25 (36) months	Arthroscopic (79%) and miniopen (21%) rotator cuff repairs	Pain severity (VAS) Function (ASES) Assessment at baseline, and at 12 months	Anxiety and depression (HADS)	Preoperative depression and anxiety are not predictive of poor postoperative outcome at 12 months
De Bruijn et al., 2007	N=108 (M/F), 49 People with a new and untreated episode of shoulder complaints that had lasted less than three months, no fractures Duration of shoulder pain at baseline not specified	An education and activation approach (minimum two and maximum six sessions of 20 minutes over a period of six weeks) in addition to usual care or usual care alone according to the clinical guidelines of the Dutch College of General Practitioners	Change in disability (SDQ) assessment at baseline and at 6 and 26 weeks follow-up	Anxiety, depression, Distress and somatization (4DSQ) Catastrophizing and coping (PCCL)	Higher catastrophizing was related to more functional limitations at 6 and 26 weeks. None of the other assessed psychological factors were related to function at follow-up.

Ekeberg et al, 2010	N=104 (M/F), 52(12) Persons with a clinical diagnosis of rotator cuff disease Duration of pain at baseline: 0-6 month in 30%, 6-12 month in 24%, 12-24 months in 22%, more than 12 month in 24% of included participants	Local and systemic corticosteroid injection in rotator cuff disease	Pain and disability (SPADI) assessment at baseline and at 6 weeks follow-up	Emotional distress (Hopkins symptoms checklist) Patient expectancies (7 point Likert scale)	Emotional distress and patient expectations are not associated with pain and disability at 6 weeks
Engebretsen et al., 2010	N=105 (M/F), 48(10.7) Persons with subacromial shoulder pain for at least 3 months Duration of pain at baseline: 3-6 month in 33%, 6-12 month in 29%, more than 12 month in 38% of included participants	Supervised exercises (two 45-minute sessions per week for a maximum of 12 weeks) or radial extracorporeal shockwave therapy (once a week for 4 to 6 weeks)	Pain and disability (SPADI) assessment at baseline and at 1 year follow-up	Emotional distress (Hopkins symptoms checklist) Self-efficacy (test not specified)	None of the assessed psychological factors influences the 1 year outcome
Jain et al., 2018a	N=50; M/F; 59(9) Persons with symptomatic (for at least 4 weeks) rotator cuff tears undergoing operative treatment Mean (range) duration of pain at baseline: 6 (2-18) months	Rotator cuff open repair or transosseous equivalent	Pain and disability (SPADI) assessment at baseline and at 3, 6, 12, and 18 months	Fear-avoidance beliefs – physical activity subscale (FABQ)	The FABQ physical activity score predicts SPADI such that those with higher FABQ physical activity scores (more fear avoidance behavior) had higher SPADI scores (worse shoulder pain and function). This difference was most pronounced at 3 months of follow-up
Jain et al., 2018b	N=70; M/F; 63 (8) Persons with symptomatic (for at least 4 weeks) rotator cuff tears Mean (SD) duration of pain at baseline: 21 (38) months	Non-operative treatment recommendations included physical therapy. Frequency and duration of physical therapy were not standardized. Patients could pursue corticosteroid injections or medications as per their preferences.	Pain and disability (SPADI) assessment at baseline and at 1 year follow-up 3, 6, 12, and 18 months	Fear-avoidance beliefs – physical activity subscale (FABQ)	Fear-avoidance beliefs were not associated with pain and dysfunction

Karel et al. (2017)	N=389 (M/F), 50 (13) Persons with shoulder pain of any duration, who did not have surgery in the last 12 months Median duration of complaints: 12 weeks (IQR: 6-26)	Physical therapy, various treatment modalities	Pain severity (11-point NRS) Assessment at baseline and 6 months	Anxiety and depression (dimension of the EQ-5D)	Feelings of depression or anxiety are no predictor for pain at 6 months after physical therapy treatment.
Kennedy et al, 2006	N=361 (M/F), 50 (15) Persons with shoulder pain due to soft tissue shoulder disorders 24% had symptoms for less than 4 weeks, 25% had symptoms between 4 and 12 weeks, 49% had symptoms longer than 3 months	8% received operative treatment, 89% received non-operative treatment, information was missed in 3%. All patients followed physiotherapy treatment	Disability (DASH and change in DASH) Assessment at baseline and at discharge from physiotherapy (maximal at 12 weeks after therapy start)	Patients' expectations of recovery (4 point scale)	Patients' expectations for recovery was no predictors of disability or change in disability at discharge (or 12 weeks)
Koorevaar et al, 2016	N=315 (M/F), 52(16) Persons receiving shoulder surgery for other reasons than diagnostic arthroscopy, arthrodesis or fracture Mean duration of shoulder pain at baseline: 25 (36) months	Surgery for subacromial pain syndrome (n=39);RC rupture (n=88);instability (n=67);AC (n=34) or GH (n=43) osteoarthritis; other (n=44)	Upper-extremity disability (DASH) Assessment at 12 months	Anxiety, depression, Distress and somatization (4DSQ)* *Also assessed at follow up	Preoperative psychological disorders are not associated with a change in DASH score after shoulder surgery. Postoperative symptoms of psychological disorders are associated with a worse DASH score
Kromer et al. (2014)	N=90 (M/F), 52(11) Subacromial shoulder pain for at least 4 weeks, no diagnosed instability or previous dislocation, no surgery in the last 12 months Mean duration of shoulder pain (weeks): 105 (153)	Physiotherapy, consisting of supervised stretching and strengthening exercises for the shoulder, shoulder girdle, and thoracic spine (10 sessions within 5 weeks) alone or combined with shoulder and cervical spine mobilizations, and individualized education about the pathology and the	Shoulder function (function subscale of SPADI) Assessment at baseline and at 3 months follow-up	Fear-avoidance beliefs – physical activity subscale (FABQ) Pain catastrophizing (PCS)	Fear-avoidance beliefs or catastrophizing do not contribute to change in disability after receiving 3 months of physiotherapy.

		most pain-provocative activities of daily living. Afterward, all participants continued their exercises at home for another 7 weeks.			
Kvalvaag et al. (2017)	N=130 (M/F), 47(10) Persons with subacromial shoulder pain for at least 3 months Radial extracorporeal shockwave therapy + exercises: Duration of pain at baseline: 3-6 month in 17%, 6-12 month in 26%, more than 12 month in 57% of included participants Sham radial extracorporeal shockwave therapy + exercises: Duration of pain at baseline: 3-6 month in 23%, 6-12 month in 26%, more than 12 month in 61% of included participants	Radial extracorporeal shockwave therapy or sham radial extracorporeal shockwave therapy in addition to supervised exercises (one 40-minute session during the first four weeks, and two 45-minute sessions per week for the next eight weeks)	Pain and disability (SPADI) assessment at baseline and at 1 year follow-up	Emotional distress (Hopkins symptoms checklist) Self-efficacy (test not specified) Patient's expectations of treatment effect after 3 months	Low patient expectations were the strongest predictor of a negative SAPDI outcome at one year
Laslett et al., 2015	N=161 (M/F), 44(14) patients with a new episode of shoulder pain of any duration Duration of shoulder pain (days): 108 (194)	Conservative therapy (physiotherapy including exercise, soft tissue and joint mobilization, guidance on return to usual work/activities, corticosteroid injection)	shoulder pain and disability (SPADI) Assessment at baseline and 3 weeks and 3,6, 12 months follow-up	Fear-avoidance beliefs (FABQ)	Greater fear-avoidance is a predictor of excellent shoulder pain and disability at 12 months follow-up *
O'Malley et al, 2004	N=117 (M/F), 52 (16) Patients with shoulder pain due to arthritis (11%), dislocation (16%), nerve injury (5%), rotator cuff (30%), sprain (34%), other (4%)	16% underwent shoulder surgery, 40% started a regimen of physical therapy, and 45% began a course of medications for their shoulder problems	Shoulder function (Flexilevel Scale of Shoulder Function)	Outcome expectancies (3-item Patient Shoulder Outcome Expectancies measure)	Outcome expectancies significantly predict changes in shoulder function and accounted for 10% of the variance in functional improvement

	Duration of shoulder pain: 67% reported chronic shoulder conditions				
Potter et al, 2015	N=70 (M/F), 61 Patients with shoulder pain due to full-thickness rotator cuff tears undergoing arthroscopy Duration of shoulder pain: ?	Shoulder arthroscopy for a reparable full-thickness rotator cuff tear	Shoulder pain intensity (VAS) Shoulder function (SST and ASES) Assessment at baseline and 12 months	Psychological distress (Distress Risk assessment Method questionnaire)	Psychological distress does not influence shoulder pain and function 1 year after rotator cuff repair
Reilingh et al. (2008)	N=587 (M/F), 51(14) Persons with shoulder pain of any duration, without fracture or luxation Duration of shoulder pain: 0-2 weeks in 14%, 3-6 weeks in 21%, 6-13 weeks in 24%, more than 13 wks in 41%	Usual care from general practitioner (including information on the prognosis, advice regarding activities and treatment paracetamol, NSAIDs, injection of corticosteroids or physiotherapy referral)	Shoulder pain intensity (VAS) Assessment at baseline and 6 months follow-up	Catastrophizing and coping (PCCL) Anxiety, Depression, Somatization, Distress (4DSQ)	A lower score on pain catastrophizing (assessed as part of the PCCL) is a predictor for a better pain outcome at 6 months after therapy start in patients with chronic shoulder pain. For patients with (sub)acute shoulder pain, no psychological factor predicts the pain outcome.
Thorpe et al., 2018	N=124 (M/F), 21-79 Patients undergoing shoulder surgery for rotator cuff related shoulder pain or rotator cuff tear Duration of shoulder pain: ?	rotator cuff repair with or without subacromial decompression or arthroscopic subacromial decompression only	Shoulder function (ASES) Assessment at baseline and 3 and 12 months follow-up	Fear avoidance beliefs (Tampa scale for kinesiophobia) Pain catastrophizing (PCS) Pain self-efficacy (pain self-efficacy questionnaire) Depression, anxiety and stress (DASS)	Poorer psychologic functioning was found to be independently associated with worse ASES score at 3 months and 12 months following surgery

Van der Windt et al., 2007	N=587 (M/F), 51(14) Persons with shoulder pain of any duration, without fracture or luxation Duration of shoulder pain: 0-2 weeks in 14%, 3-6 weeks in 21%, 6-13 weeks in 24%, more than 13 wks in 41%	Usual care from general practitioner (including information on the prognosis, advice regarding activities and treatment, paracetamol, NSAIDs, injection of corticosteroids or physiotherapy referral)	Disability (SDQ) Assessment at baseline and 3 months follow-up	Pain catastrophizing (catastrophizing subscale of the PCCL) Fear-avoidance beliefs (physical activity sub-score FABQ) Distress and somatization (4DSQ)	Associations of all psychological factors with outcome are weak and non-significant.
Woollard et al, 2017	N=46 (M/F), 46.5 Persons scheduled for subacromial decompression with(out) supraspinatus repair (tears less than 2 cm) Duration of shoulder pain: 3 – 6 months: n=14; 7 – 12 months: n=9; 13 – 24 months: n=14; 25 months: n=7	Arthroscopic subacromial decompression	Function and pain (Western Ontario Rotator Cuff Index and DASH) Assessment at baseline and 6 months follow-up	Fear avoidance beliefs (FABQ) Depression (Clinical Epidemiologic Studies Depression Scale) Anxiety (Beck Anxiety Inventory)	Having high fear-avoidance behavior scores on the FABQ, especially the work subscale, is associated with much lower chance of responding well to rotator cuff surgery as measured by self-reported disability.
MODERATING VALUE OF PSYCHOLOGICAL VARIABLE					
Coronado et al., 2017	N=63 (M/F), 39 (15) Atraumatic shoulder pain of less than 6 months, not related to adhesive capsulitis or fracture Duration of shoulder pain at baseline not specified	2-week course of physiotherapy treatment (3 sessions) involving spinal manipulation, shoulder manipulation, or shoulder exercises.	Change in shoulder pain intensity (BPI) Change in shoulder function (Penn-F) Assessment at baseline and 3	Optimism (LOT-R) Fear avoidance (physical activity subscale of FABQ) Pain Catastrophizing (PCS)	At 3 months after starting physiotherapy, optimism decreases the negative influence of pain catastrophizing on shoulder function, but not on pain intensity. Optimism does not alter the influence of fear-avoidance beliefs on shoulder pain or function

	months follow-up

4DSQ: four-Dimensional Symptom Questionnaire; ASES: American Shoulder and Elbow Surgeons; BPI: brief pain inventory; DASH: Disabilities of the arm, shoulder and hand; GPES: Global perceived effect scale; LOT-R: Life orientation test revised; NRS: numeric rating scale; FABQ: Physical activity subscale of fear-avoidance beliefs questionnaire; PCCL: Pain Coping and Cognition List; PCS: Pain catastrophizing scale; Penn-F: Pennsylvania Shoulder Score function subscale SDQ: Shoulder Disability Questionnaire; SPADI: Shoulder pain and Disability questionnaire

OR: odds ratios; CI confidence interval

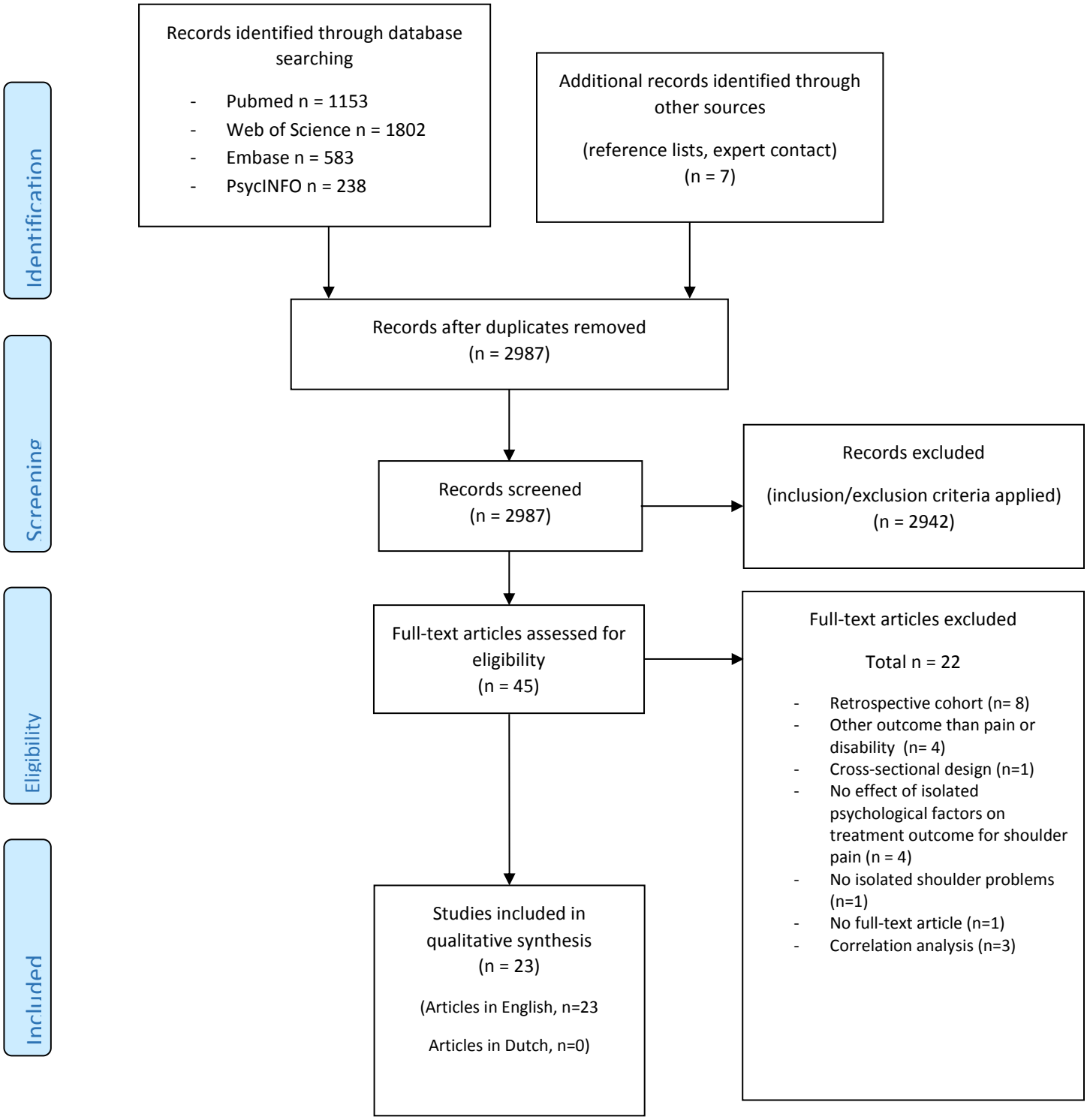
*Although Laslett et al (2014) reported a predictive role of baseline fear-avoidance beliefs on pain and disability at 6 months and one year following treatment, a closer look at the results indicated clinically irrelevant odds ratios for the FABQ (Odds ratio (95%CI)=1.03 (1.00–1.07), p= 0.08 at 6 months; Odds ratio (95%CI)=1.01 (1.03–1.17), p= 0.00 at one year).

Table 4. Summary of psychological variables at baseline with or without predictive value for treatment outcomes pain and/or disability per treatment type, plus timing of follow-up assessment and used assessment scale

	Baseline psychological factors with predictive value (follow-up time)			**Baseline psychological factors without predictive value (follow-up time)**		
	Surgery	Mixed interventions	Physiotherapy treatment	Surgery	Mixed interventions	Physiotherapy treatment
Fear-avoidance	6 months (DASH and Western Ontario RC index) (Woollard) 3 and 12 months (ASES) (Thorpe)[a] 3, 6, 12, and 18 months (SPADI) (Jain)	6/12 months (SPADI) (Laslett)[b]			3 weeks/3 months (SPADI) (Laslett) 3 months (SDQ) (Van der Windt)	3 months (SPADI function) (Kromer) 3, 6, 12, and 18 months (SPADI) (Jain)
Pain catastrophizing	3 and 12 months (ASES) (Thorpe)[a]	6 weeks/6 months (SDQ) (De Bruijn) 6 months (VAS) (Reilingh)[c]			3 months (SDQ) (Van der Windt)	3 months (SPADI function) (Kromer) 3 months (Western Ontario RC index) (Braun)
Self-efficacy	3 and 12 months (ASES) (Thorpe)[a]		6 weeks/6 months (SPADI-QuickDASH) (Chester 2016 and 2019)		1 year (SPADI)(Engebretsen) 1 year (SPADI)(Kvalvaag)	
Expectations of recovery		1 year (SPADI)(Kvalvaag) 3 months (Flexilevel)(O'Malley)[d]	6 weeks/6 months (SPADI-QuickDASH) (Chester 2016 and 2019)		6 weeks (SPADI) (Ekeberg) 3 months ((DASH) (Kennedy)[e]	
Anxiety				1 year (ASES – VAS) (Cho 2015 and 2017) 1 year (DASH) (Koorevaar)[f]	6 wks/6 months (SDQ) (De Bruijn) 6 months (VAS) (Reilingh)	6 weeks/6 months (SPADI-QuickDASH) (Chester) 6 months (NPRS)(Karel)
Depression	3 and 12 months (ASES) (Thorpe)[a]			1 year (ASES – VAS) (Cho 2015 and 2017) 1 year (DASH) (Koorevaar)[f] 6 months (DASH and Western Ontario RC index) (Woollard)	6 wks/6 months (SDQ) (De Bruijn) 6 months (VAS) (Reilingh)	6 weeks/6 months (SPADI-QuickDASH) (Chester) 6 months (NPRS)(Karel)
Distress	3 and 12 months (ASES) (Thorpe)[a]			1 year (DASH) (Koorevaar)[f] 1 year (VAS, SST, ASES)(Potter)	6 wks/6 months (SDQ) (De Bruijn) 3 months (SDQ) (Van der Windt) 1 year (SPADI) (Engebretsen) 6 months (VAS) (Reilingh) 6 weeks (SPADI) (Ekeberg)	
Somatisation				1 year (DASH) (Koorevaar)[f]	6 wks/6 months (SDQ) (De Bruijn) 3 months (SDQ) (Van der Windt)	

	6 months (VAS) (Reilingh)
Coping	6 wks and 6 months (SDQ) (De Bruijn)

[a]: Patients were categorized in a cluster with lower or higher scores on the psychologic functioning measures depression, anxiety and stress, pain catastrophizing, pain self-efficacy and fear-avoidance. The cluster with poorer psychologic function exhibited moderate levels of depression and stress, anxiety within normal limits, high levels of kinesiophobia, mild to moderate levels of catastrophizing, and low levels of pain self-efficacy; [b]:Although Laslett et al (2014) reported a predictive role of baseline fear-avoidance beliefs on pain and disability at 6 months and one year following treatment, a closer look at the results indicated clinically irrelevant odds ratios for the FABQ (Odds ratio (95%CI)=1.03 (1.00–1.07), p= 0.08 at 6 months; Odds ratio (95%CI)=1.01 (1.03–1.17), p= 0.00 at one year). [c]: in chronic pain patients only. [d] : within the assessed cohort, 45% started physiotherapy, 40% received medication, 16% underwent surgery; [e] : within the assessed cohort, 89% received non-surgical treatment and 8% underwent surgery; [f]: When post-operative psychological symptoms are included in the prediction model. If not included, there is a predictive value of psychological factors. ASES: American shoulder and Elbow Score; DASH: Disabilities of the Arm, Shoulder and Hand questionnaire; Penn-F: Function Subscale of the Pennsylvania Shoulder Score; SDQ: Shoulder Disability Questionnaire; SPADI: Shoulder Pain and Disability Index; STT: Simple Shoulder test; VAS: visual analogue scale for pain. Studies with high risk of bias are marked in grey coloring.


Identification
Screening
Eligibility
Included
Records identified through database searching
- Pubmed n = 1153
- Web of Science n = 1802
- Embase n = 583
- PsycINFO n = 238
Additional records identified through other sources
(reference lists, expert contact)
(n = 7)
Records after duplicates removed
(n = 2987)
Records screened
(n = 2987)
Records excluded
(inclusion/exclusion criteria applied)
(n = 2942)
Full-text articles assessed for eligibility
(n = 45)
Full-text articles excluded
Total n = 22
- Retrospective cohort (n= 8)
- Other outcome than pain or disability (n= 4)
- Cross-sectional design (n=1)
- No effect of isolated psychological factors on treatment outcome for shoulder pain (n = 4)
- No isolated shoulder problems (n=1)
- No full-text article (n=1)
- Correlation analysis (n=3)
Studies included in qualitative synthesis
(n = 23)
(Articles in English, n=23
Articles in Dutch, n=0)

Appendix 1. Search terms

SHOULDER	Shoulder or Scapul* or Subacromial or Rotator cuff or Glenohumer*
DISORDER	Pain or Disorder or Impairment or *function or Disease or Abnormalit* or Complaint or Disabil* or Discomfort* or Patholog* or Problem
INTERVENTION	Injection OR Shock wave OR Conservative treatment OR Medication OR Physical therapy OR Physiotherapy OR Exercise therapy OR Rehabilitation OR Physical therapist practice OR General practice OR surgery OR subacromial decompression OR surgical OR prosthesis OR arthroplast* OR repair
PSYCHOLOGICAL FACTOR	Psycholog* OR Depressi* OR *Stress* OR Catastroph* OR Fear* OR Anxi* OR Kinesiophob* OR Emotion* OR Uncertaint* OR Hypervigilance OR Coping OR Anger OR Expecta* OR Belief* OR Perception* OR Self-efficacy OR Cognition* OR Behavio*r

Appendix 2. Search strategies in the different databases

Pubmed:

((((Shoulder[Title/Abstract] OR Scapul*[Title/Abstract] OR Subacromial[Title/Abstract] OR Rotator cuff[Title/Abstract] OR Glenohumer*[Title/Abstract])) AND (Pain[Title/Abstract] OR Disorder[Title/Abstract] OR Impairment[Title/Abstract] OR *function[Title/Abstract] OR Disease[Title/Abstract] OR Abnormalit*[Title/Abstract] OR Complaint[Title/Abstract] OR Disabil*[Title/Abstract] OR Discomfort*[Title/Abstract] OR Patholog*[Title/Abstract] OR Problem[Title/Abstract])) AND (Injection[Title/Abstract] OR Shock wave[Title/Abstract] OR Conservative treatment[Title/Abstract] OR Medication[Title/Abstract] OR Physical therapy[Title/Abstract] OR Physiotherapy[Title/Abstract] OR Exercise therapy[Title/Abstract] OR Rehabilitation[Title/Abstract] OR Physical therapist practice[Title/Abstract] OR General practice[Title/Abstract] OR surgery[Title/Abstract] OR subacromial decompression[Title/Abstract] OR surgical[Title/Abstract] OR prosthesis[Title/Abstract] OR arthroplasty*[Title/Abstract] OR repair[Title/Abstract])) AND (Psycholog*[Title/Abstract] OR Depressi*[Title/Abstract] OR *Stress*[Title/Abstract] OR Catastroph*[Title/Abstract] OR Fear*[Title/Abstract] OR Anxi*[Title/Abstract] OR Kinesiophob*[Title/Abstract] OR Emotion*[Title/Abstract] OR Uncertaint*[Title/Abstract] OR Hypervigilance[Title/Abstract] OR Coping[Title/Abstract] OR Anger[Title/Abstract] OR Expecta*[Title/Abstract] OR Belief*[Title/Abstract] OR Perception*[Title/Abstract] OR Self-efficacy[Title/Abstract] OR Cognition*[Title/Abstract] OR Behavio*r[Title/Abstract])

Web of science:

TOPIC: (Shoulder or Scapul* or Subacromial or Rotator cuff or Glenohumer*) AND TOPIC: (Pain or Disorder or Impairment or *function or Disease or Abnormalit* or Complaint or Disabil* or Discomfort* or Patholog* or Problem) AND TOPIC: (Injection OR Shock wave OR Conservative treatment OR Medication OR Physical therapy OR Physiotherapy OR Exercise therapy OR Rehabilitation OR Physical therapist practice OR General practice OR surgery OR subacromial decompression OR surgical OR prosthesis OR arthroplasty* OR repair) AND TOPIC: (Psycholog* OR Depressi* OR *Stress* OR Catastroph* OR Fear* OR Anxi* OR Kinesiophob* OR Emotion* OR Uncertaint* OR Hypervigilance OR Coping OR Anger OR Expecta* OR Belief* OR Perception* OR Self-efficacy OR Cognition* OR Behavio*r). Refined by: DOCUMENT TYPES: (ARTICLE)

Embase:

(('shoulder'/exp OR shoulder OR scapul* OR subacromial OR rotator) AND ('cuff'/exp OR cuff) OR glenohumer*) AND ('pain'/exp OR pain OR 'disorder'/exp OR disorder OR 'impairment'/exp OR impairment OR 'function'/exp OR function OR 'disease'/exp OR disease OR abnormalit* OR 'complaint'/exp OR complaint OR disabil* OR discomfort* OR patholog* OR problem) AND ((((((('injection'/exp OR injection OR 'shock'/exp OR shock) AND ('wave'/exp OR wave) OR conservative) AND ('treatment'/exp OR treatment) OR 'medication'/exp OR medication OR physical) AND ('therapy'/exp OR therapy) OR

'physiotherapy'/exp OR physiotherapy OR 'exercise'/exp OR exercise) AND ('therapy'/exp OR therapy) OR 'rehabilitation'/exp OR rehabilitation OR physical) AND therapist AND ('practice'/exp OR practice) OR general) AND ('practice'/exp OR practice) OR 'surgery'/exp OR surgery OR subacromial) AND ('decompression'/exp OR decompression) OR surgical OR 'prosthesis'/exp OR prosthesis OR arthroplasty* OR 'repair'/exp OR repair) AND (psycholog* OR depressi* OR stress* OR catastroph* OR fear* OR anxi* OR kinesiophob* OR emotion* OR uncertaint* OR 'hypervigilance'/exp OR hypervigilance OR 'coping'/exp OR coping OR 'anger'/exp OR anger OR expecta* OR belief* OR perception* OR 'self efficacy'/exp OR 'self efficacy' OR cognition* OR behavio*r)

PsycINFO:

(('shoulder'/exp OR shoulder OR scapul* OR subacromial OR rotator) AND ('cuff'/exp OR cuff) OR glenohumer*) AND ('pain'/exp OR pain OR 'disorder'/exp OR disorder OR 'impairment'/exp OR impairment OR 'function'/exp OR function OR 'disease'/exp OR disease OR abnormalit* OR 'complaint'/exp OR complaint OR disabil* OR discomfort* OR patholog* OR problem) AND ((((((('injection'/exp OR injection OR 'shock'/exp OR shock) AND ('wave'/exp OR wave) OR conservative) AND ('treatment'/exp OR treatment) OR 'medication'/exp OR medication OR physical) AND ('therapy'/exp OR therapy) OR 'physiotherapy'/exp OR physiotherapy OR 'exercise'/exp OR exercise) AND ('therapy'/exp OR therapy) OR 'rehabilitation'/exp OR rehabilitation OR physical) AND therapist AND ('practice'/exp OR practice) OR general) AND ('practice'/exp OR practice) OR 'surgery'/exp OR surgery OR subacromial) AND ('decompression'/exp OR decompression) OR surgical OR 'prosthesis'/exp OR prosthesis OR arthroplasty* OR 'repair'/exp OR repair) AND (psycholog* OR depressi* OR stress* OR catastroph* OR fear* OR anxi* OR kinesiophob* OR emotion* OR uncertaint* OR 'hypervigilance'/exp OR hypervigilance OR 'coping'/exp OR coping OR 'anger'/exp OR anger OR expecta* OR belief* OR perception* OR 'self efficacy'/exp OR 'self efficacy' OR cognition* OR behavio*r)