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SHOULDER

Substantial influence of psychological factors on return to sports after anterior shoulder instability surgery: a systematic review and meta-analysis

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Abstract

Purpose This systematic review and meta-analysis aimed to (1) determine the proportion of patients who underwent anterior shoulder instability surgery and did not return to sports for psychological reasons and (2) estimate differences in psychological readiness scores between patients who did and did not return to sports.

Methods The EBSCOhost/SPORTDiscus, PubMed/Medline, Scopus, EMBASE and Cochrane Library databases were searched for relevant studies. The data synthesis included the proportion of patients who did not return to sports for psychological reasons and the mean differences in the psychological readiness of athletes who returned and those who did not return to sports. Non-binomial data were analysed using the inverse-variance approach and expressed as the mean difference with 95% confidence intervals.

Results The search yielded 700 records, of which 13 (1093 patients) were included. Fourteen psychological factors were identified as potential causes for not returning to sports. The rates of return to sports at any level or to the preinjury level were 79.3% and 61.9%, respectively. A total of 55.9% of the patients cited psychological factors as the primary reason for not returning to sports. The pooled estimate showed that patients who returned to sports had a significantly higher Shoulder Instability-Return to Sport After Injury score ($P < 0.00001$) than those who did not, with a mean difference of 30.24 (95% CI 24.95–35.53; $I^2 = 0\%$; n.s.).

Conclusions Psychological factors have a substantial impact on the rate of return to sports after anterior shoulder instability surgery. Patients who returned to sports had significantly higher psychological readiness than those who did not return to sports. Based on these results, healthcare professionals should include psychological and functional measurements when assessing athletes' readiness to return to sports.

Level of evidence Level IV.

Keywords Anterior shoulder instability surgery · Return to sports · Psychological factors · Fear of reinjury · The shoulder instability-return to sport after injury (SIRSI)

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Abbreviations

MINORS	Methodological index for non-randomised studies
PERSiST	Implementing PRISMA in Exercise, Rehabilitation, Sport medicine and SporTs science
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
RTS	Return to sports
RTSA	Return to sports at any level
RTSP	Return to sports at the preinjury level
SIRSI	Shoulder Instability-Return to Sport After Injury
TSK	Tampa scale of kinesiophobia

Introduction

Anterior shoulder instability is a prevalent and significant concern in athletes. This pathology can hinder an individual's athletic participation and negatively impacting their daily activities and overall quality of life [4, 6]. Open or arthroscopic anterior shoulder instability surgery usually yields good to excellent functional results, although the reported return to sports (RTS) rate varies considerably, ranging from 53 to 100% in individual studies [1, 11, 16]. The complexity of the RTS decision-making process is influenced by several factors, including the athlete's physical condition, surgical approach, postoperative rehabilitation protocols, and psychosocial factors [37].

Several shoulder-related causes, such as recurrent instability, poor functional outcomes, loss of range of motion, pain, insufficient rehabilitation, and pre-existing conditions, could prevent athletes from returning to sports after surgery for glenohumeral instability [1, 11, 35]. Limited data exist regarding the reasons why some individuals do not RTS despite achieving excellent clinical scores after anterior shoulder instability surgery [37]. Athletic injuries are commonly associated with detrimental psychological reactions such as tension, decreased self-esteem, depression and anxiety [2, 40]. Most of these reactions are considered within the range of expected behaviours and usually improve during rehabilitation [25]. However, maladaptive psychological reactions can affect the athlete's ability to resume sports participation [41].

Psychological factors have a well-recognised impact on determining an athlete's ability to RTS, particularly after knee or elbow reconstructive surgery [2, 7, 27, 45, 47]. Kinesiophobia is an excessive fear of movement that can lead to avoidance of physical activity [9]. It might present as fear of reinjury, fear of pain, or discomfort when performing physical activities [43]. The term fear of reinjury, often not distinguished from kinesiophobia, has been reported to be one of the most prevalent psychological reasons for not returning to sports, cited by around 52–77% of athletes after anterior cruciate ligament reconstructions [13, 27].

Similarly, several studies have demonstrated that psychological and social aspects of postoperative recovery can significantly impact RTS in athletes who underwent anterior instability surgery, despite achieving a high level of shoulder function and expressing satisfaction with their surgical results [29, 33, 37, 41, 42]. Although the impact of psychology on RTS after anterior shoulder instability surgery has received more attention recently, to the best of our knowledge, a systematic review of the available research is lacking. Therefore, this study aimed to comprehensively review the literature and investigate the effects of psychological factors associated with RTS after anterior shoulder instability surgery. Specifically, the proportion of patients who cited psychological factors as the primary reason for not returning to sports was estimated and whether better psychological readiness scores were observed in patients who returned to sports was assessed.

Materials and methods

Eligibility criteria

Articles written in English or Spanish were eligible for inclusion. Studies of any level of evidence and meeting the following criteria were included: (1) studies involving patients with anterior glenohumeral instability, (2) those who underwent anterior shoulder instability surgeries, (3) reporting rates of RTS while assessing psychological factors that affect the decision for RTS or (4) comparing the results of psychological readiness questionnaires between athletes who returned to sports and those who did not. In addition, we excluded articles in which (1) postoperative outcomes were not considered, (2) the assessment of RTS was not included in the postoperative evaluation, (3) articles that presented RTS rates after shoulder stabilisation procedures but did not assess psychological factors as potential causes of not returning, (4) reporting complete RTS at the same or higher preinjury level with no RTS failures reported for analysis, (5) studies with less than 1-year follow-up and (6) studies that included less than ten patients. The following articles were also excluded: reviews, expert opinions, letters, book chapters, conference abstracts, unpublished manuscripts, case reports, original articles on linguistic validation of functional tests or scores, and editorials. The degree of agreement among the evaluators for selecting articles at each stage was assessed using the κ statistic interpreted according to Cohen [8].

Search strategy and selection process

This systematic review and meta-analysis were conducted following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) [31, 32] and the implementing PRISMA in Exercise, Rehabilitation, Sport medicine and SporTs science (PERSiST) guidelines. A comprehensive search was conducted in five electronic databases: EBSCOhost/SPORTDiscus, PubMed/Medline, Scopus, EMBASE and the Cochrane Library. Our search strategy included the following medical subject headings (MeSH) terms and free-text terms: (1) anterior shoulder instability, shoulder dislocation or shoulder luxation; (2) return to sports, return to play, RTS or RTP; and (3) fear, depression, emotions, anxiety, psycho, fear of reinjury, individual personality traits, personal reasons, psychological concerns, competing interests, kinesiophobia, internal stressors and motivators (Supplementary File 1).

The search was limited to articles published from database inception to January 31, 2023. Two reviewers (AVG and GA) independently screened articles and evaluated their eligibility for inclusion. After removing duplicate articles, the screening process was performed manually and involved analysing the titles and abstracts, followed by a full-text review. In addition, a citation search was conducted for potentially relevant articles. Citations from the selected studies were examined, as were citations from other systematic reviews or meta-analyses related to the topic of our study. Any disagreements regarding study eligibility were resolved by the senior author. When studies compared different surgical techniques, the results were analysed separately if feasible.

Data collection

Two reviewers independently extracted data using a customised Microsoft Excel spreadsheet. The extracted data were compared to ensure consistency between reviewers. Discrepancies between the spreadsheets were resolved through discussion. If disagreements remained, a third author was involved in resolving discrepancies.

Data items

The collected study information included the author, publication date, journal name, study design, level of evidence, number of patients, patient age and sex, mean follow-up time, sport type, level of competition, surgical procedure, mean time to RTS, proportion of patients who returned to sports at any level (RTSA), and the preinjury level (RTSP). RTSP was defined as RTS at a level equal to or higher than the preinjury one [12]. Studies with predefined athlete RTS ratios (retrospective case–control studies) were excluded from our pooled calculation of RTS rate. The rationale was the specific design of these matched cohorts, which primarily aimed to investigate particular factors, including the impact of psychological influences on RTS, rather than provide a comprehensive representation of patients undergoing shoulder instability surgery. Consequently, these study populations may not accurately show the true RTS rates. Data on the reason for RTS failure remained relevant to our analysis.

In addition, patient-reported outcomes that quantified the activity level to assess the return to the preinjury level were recorded. The primary outcome of interest was the proportion of patients who cited psychological factors as their primary reason for not returning to sports. The psychological factors considered in this analysis were derived from a previous study reporting the psychological reasons involved in RTS after shoulder stabilisation surgery [41]. The secondary outcome was the evaluation of psychological readiness using validated scores in patients who returned to sports and those who did not. In addition, data from the Shoulder Instability-Return to Sport After Injury (SIRSI) score [15] and the Tampa Scale of Kinesiophobia (TSK) [24] were collected to compare the psychological readiness of athletes.

Assessment of risk of bias

Two authors (AVG and GA) rigorously evaluated the quality of each study using the Methodological Index for Non-Randomised Studies (MINORS) [39], which assigns scores based on the study design and the level of bias present. The maximum score for comparative studies is 24, while non-comparative studies have a maximum score of 16. Higher scores indicate higher methodological quality and a lower risk of bias. When the reviewers had differing opinions, the consensus was reached through discussion. The level of evidence was then assigned using the standards established by Wright et al. [46]

Synthesis methods and effect measures

Data from the controlled studies were transferred to the Review Manager software (The Cochrane Collaboration, RevMan version 5.4.1) for pooled analyses. Mean differences (MD) and 95% confidence intervals (95% CI) for continuous variables were analysed using the inverse-variance approach. A random-effects model was applied in the analysis. For quantitative data pooling, at least two controlled studies were necessary to assess MD in psychological readiness scores among patients who did or did not return to sports practice. The level of statistical significance was set at $P < 0.05$. For studies that reported medians and inter-quartile ranges rather than means and standard deviations (SD) to record outcome measures, the methods of Wan et al. [44] were employed to estimate the

respective mean and SD of the study population. Descriptive statistics were used to summarise the data when the study design or statistical heterogeneity prevented us from conducting a meta-analysis. Weighted means and SD were calculated when necessary to summarise the patient demographic data. Furthermore, the RTS rate and proportion of patients who cited psychological factors as the primary reason for not returning to sports were calculated.

Heterogeneity

The heterogeneity between studies was evaluated using the chi-square test and I^2 statistic [18]. The I^2 values were interpreted according to the Cochrane Handbook: 0–40% might not be important, 30–60% may represent moderate heterogeneity, 50–90% represent substantial heterogeneity and 75–100% represent considerable heterogeneity [10].

Results

Study selection

Initially, 316 records were obtained through electronic searches and 384 through citation searching. Thirteen studies met the inclusion criteria in our analysis [12, 17, 19, 20, 22, 23, 26, 34, 36–38, 41, 42], including three controlled studies that met the eligibility criteria for the meta-analysis [19, 20, 36]. A PRISMA search flow diagram is shown in Fig. 1. The agreement between the reviewers was almost perfect in the title and abstract stage ($\kappa = 0.83$, 95% CI 0.79–0.88) and perfect ($\kappa = 1$) in the full-text review stage.

Study characteristics

Among the 13 articles included, there were seven retrospective case series [17, 22, 23, 26, 38, 41, 42], three case–control studies [19, 20, 34], two retrospective cohort studies [12, 37], and one prospective cohort study [36] (Table 1). These studies were published between 1998 and 2022, including

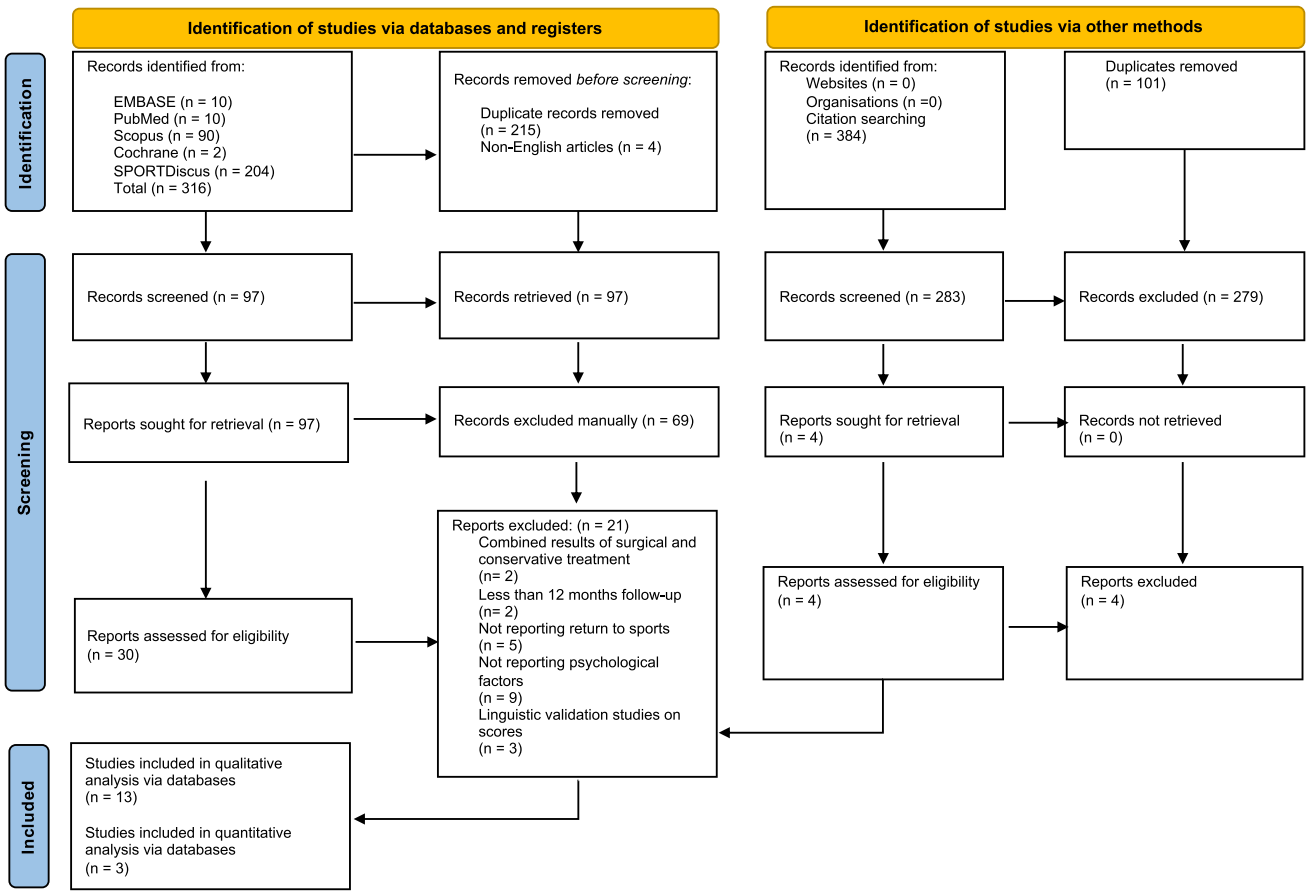

Fig. 1 Prisma flow diagram of the literature search

Table 1 Characteristics of the studies included in the systematic review

Authors	Year	Journal	LOE	Study design	Surgical technique	Approach	Follow-up, m Mean ± SD (range)	MINORS
Feng et al. [12]	2021	OJSM	III	Retrospective cohort	Bankart/ Bankart + Remplissage	Arthroscopic	67.2	19
Harada et al. [17]	2023	BMC MUSCULOSKEL DIS	IV	Case series	Bankart	Arthroscopic	44.5 ± 19.6	12
Hurley et al. [20]	2022	OJSM	III	Case–control	Latarjet	Open	40	17
Hurley et al. [19]	2022	THE SURGEON	III	Case–control	Bankart	Arthroscopic	62.7	16
Kee et al. [22]	2018	KSSTA	IV	Case series	Latarjet	Open	67 (24–113)	9
Kjeldsen et al. [23]	1996	SCAND J MED SCI SPOR	IV	Case series	Bankart	Arthroscopic	24 (16—36)	7
Murray et al. [26]	2013	SHOULDER & ELBOW	IV	Case series	Bankart	Arthroscopic	43.3 ± 22.2	8
Paul et al. [34]	2022	ASMAR	III	Case–control	Bankart/ Bankart + Remplissage	Arthroscopic	33.6 ± 21.6	21
Rossi et al. [37]	2021	OJSM	III	Retrospective cohort	Bankart	Arthroscopic	44 (24—90)	17
Rossi et al. [36]	2022	AJSM	II	Prospective cohort	Bankart/Latarjet	Arthroscopic/ Open	20	21
Salmon et al. [38]	1998	ARTHROSCOPY	IV	Case series	Bankart	Open	(24—48)	7
Tjong et al. [41]	2015	AJSM	IV	Case series	Bankart	Arthroscopic	> 24	12
Vascellari et al. [42]	2019	JOINTS	IV	Case series	Bankart/Latarjet	Arthroscopic/ Open	61 (12—156)	10

AJSM The American Journal of Sports Medicine; *ARTHROSCOPY* arthroscopy: the journal of arthroscopic and related surgery; *ASMAR* Arthroscopy, Sports Medicine, and Rehabilitation; *BMC MUSCULOSKEL DIS* BMC musculoskeletal disorders, *KSSTA* knee surgery, sports traumatology, arthroscopy; arthroscopy, sports medicine, and rehabilitation; *OJSM* orthopaedic journal of sports medicine; SCAND J MED SCI SPOR, Scandinavian journal of medicine and science in sports; MINORS; *LOE* level of evidence; *SD* standard deviation

1093 patients. Arthroscopic Bankart repair [12, 17, 19, 23, 26, 34, 37, 41, 42] was the most common surgical procedure, indicated in 738 patients, while open Bankart was performed in 17 patients [38]. In addition, 49 patients underwent a combination of arthroscopic Bankart and Remplissage [12, 34] and 175 patients underwent the open Latarjet procedure [20, 22, 42]. One study combined the results of 114 patients treated with either arthroscopic Bankart or open Latarjet [36] (Table 1). The indications and contradictions for surgical treatment are summarised in Supplementary File 2 (Table S1).

At the time of surgical treatment, the mean age of the patients was 26.5 ± 3.9 years (range, 16.8–35.5 years) [12, 17, 19, 20, 22, 23, 26, 34, 36–38, 41, 42]. Males comprised 82.8% of the total number of cases. The mean follow-up was 47.8 ± 16.3 months, according to data from 11 studies [12, 17, 19, 20, 22, 23, 26, 34, 36, 37, 42]. In addition, eight studies [12, 22, 23, 26, 36, 37, 41, 42] categorised athletes based on their level of sports practice, ranging from recreational to professional, with 324 athletes (48.1%) practicing at a competitive level. A total of 506 (53.8%) of the 941 athletes participated in contact or collision sports [17, 19, 20, 22, 26, 34, 36–38, 41], while 32.3% of the 674 athletes participated in overhead sports [12, 17, 23, 26, 34, 37] (Table 2). The sports characteristics and rehabilitation protocol are detailed in Supplementary File 2 (Table S2).

Risk of bias

The average MINORS score was 13.5 ± 5.3 for the 13 studies included in this systematic review, ranging from seven to 21. For comparative studies, the MINORS score was 18.5 ± 2.5; while for noncomparative studies, it was 9.2 ± 2.3 (Table 1).

Return to sports

All the studies reported data on RTS. However, we were unable to include 435 athletes from three retrospective case–control studies in our pooled RTS rate estimate because the proportion of athletes who did not RTS was predetermined when the matched cohort was established in each study design [19, 20, 34]. Four studies did not report the RTSA rate [26, 38, 41, 42] but evaluated RTSP. Overall, 79.3% of athletes returned to sports at any level (Table 2).

Table 2 Demographic characteristics and return to sports rate of included patients

	Value	No. of patients included	No. of studies included
Patient demographics			
Age, mean ± SD, *y*	26.5 ± 3.9	1093	13 [12, 17, 19, 20, 22, 23, 26, 34, 36–38, 41, 42]
Male, *n* (%)	891 (82.8%)	1076	12 [12, 17, 19, 20, 22, 23, 26, 34, 36, 37, 41, 42]
Follow-up, mean ± SD, *m*	47.8 ± 16.3	1051	11 [12, 17, 19, 20, 22, 23, 26, 34, 36, 37, 42]
Contact/collision sports, *n* (%)	506 (53.8%)	941	10 [17, 19, 20, 22, 26, 34, 36–38, 41]
Overhead sports, *n* (%)	162 (32.3%)	502	6 [12, 17, 23, 26, 34, 37]
Competitive level, *n* (%)	324 (48.1%)	674	8 [12, 22, 23, 26, 36, 37, 41, 42]
Return to sports			
RTSA, *n* (%)	447 (79.3%)	564	6 [12, 17, 22, 23, 36, 37][ab]
RTSP, *n* (%)	407 (61.9%)	658	10 [12, 17, 22, 23, 26, 36–38, 41, 42][a]
Time to RTSA, mean ± SD, m	6.3 ± 3.7	497	7 [12, 17, 23, 34, 36–38]

No. number of patients; *SD* standard deviation; *RTSA* return to sports at any level; *RTSP* return to sports at previous or higher level

[a]Three studies were retrospective case–control studies and were not included in the calculation of the return to sports rate [19, 20, 34]

[b]Four studies did not Report RTSA [26, 38, 41, 42]

The rate of RTSA according to the surgical procedure varied, ranging from 53 to 100% among 377 athletes who underwent the Bankart procedure [12, 17, 23, 37], 100% among those who underwent arthroscopic Bankart combined with Remplissage [12], 79% on athletes treated with the Latarjet or Bankart procedures [36] and 66% in those who underwent open Latarjet procedure [22].

The rate of RTSP was 61.9%. After the Bankart procedure the RTSP ranged from 44 to 76%. One study reported a 74% RTSP rate in patients treated with Latarjet or Bankart repair [36], whereas another study reported a rate of 23% after the Latarjet procedure [22]. However, only two studies used validated activity level scores (Brophy/Marx shoulder activity scores [5] and the Degree of Shoulder Involvement in Sport [DOSIS] scale [3]) to determine whether patients had their previous level of sports activity after surgery [41, 42]. The time to RTS and the demographic characteristics of the patients are shown in Table 2.

Psychological factors

Fourteen postoperative psychological factors or themes were identified as primary reasons for not returning to sports in 12 of the 13 included studies. The three most common psychological factors documented across studies were fear of reinjury [17, 22, 26, 36, 37], loss of confidence [19, 20, 36, 38] and loss of interest [19, 20, 34, 38]. The remaining causes are listed in Table 3. The SIRSI scores in three studies [19, 20, 36] and the shorter version of the TSK [24] in one case series [42] were the only two questionnaires recorded for psychological readiness. The methods used to assess the psychological factors are summarised in Table 3.

Effect of psychological factors on the rate of return to sports

Nine of the 13 studies reviewed [17, 19, 20, 23, 26, 34, 36–38], which included 823 athletes, assessed the proportion of patients who failed RTS primarily for psychological reasons [17, 19, 20, 23, 26, 34, 36–38]. Of the 247 athletes who did not achieve RTS, 55.9% (138) cited a psychological reason for not returning [19, 20, 23, 26, 34, 36, 37]. Kinesiophobia was reported by 74 patients (53.6%) as the primary reason for not returning to the sport, with fear of reinjury (68 patients) being the most influential intrinsic variable. The psychological factors and proportion of patients who cited them as the primary causes of not returning to sports are detailed in Table 4.

Psychological readiness for return to sports.

Three out of 13 studies used the SIRSI score to assess the psychological readiness to RTS of 417 athletes who underwent arthroscopic Bankart or Latarjet surgery [19, 20, 36]. These studies used different SIRSI cut-off scores. When a cut-off > 56 was used, 81 and 73% of returning athletes met this criterion, whereas 20 and 19% of non-returners also met the benchmark [19, 20]. In another study, 77% of athletes who returned to sports and 5% of non-returners achieved or surpassed a SIRSI score of 55 [36]. Additionally, the pooled estimate showed that patients who returned to sports had significantly higher SIRSI scores ($P < 0.001$) than those who did not, with MD of 30.24 (95% CI 24.95–35.53; $I^2 = 0\%$; n.s.) (Fig. 2). On the other hand, in a study of 66 patients, the TSK was used to assess fear of reinjury in patients who had

Table 3 Psychological factors assessment

Authors	No. of patients	Psychological factors or themes recorded	Psychological readiness questionaries for RTS	Methods of assessment
Feng et al. [12]	70	Fear of reinjury	–	Interview
Harada et al. [17]	50	Anxiety to play	–	Telephone survey
Hurley et al. [20]	105	Personal values, Change in priorities and personal interest	SIRSI	Telephone survey
Hurley et al. [19]	208	Personal values, Change in priorities and personal interest	SIRSI	Telephone survey
Kee et al. [22]	56	Fear of reinjury	–	Questionnaire
Kjeldsen et al. [23]	16	Anxiety to play, Fear of reinjury, Loss of Interest	–	Interview
Murray et al. [26]	119	Fear of reinjury	–	Postal Survey
Paul et al. [34]	39	Loss of Interest	–	Survey
Rossi et al. [37]	208	Fear of reinjury, Concern about new rehabilitation process, Lack of time (family, work, university), Change in priorities and personal interest	–	Telephone survey
Rossi et al. [36]	114	Fear of reinjury, Lack of confidence, Lack of time, Advancing age	SIRSI	Telephone survey
Salmon et al. [38]	17	Loss of confidence, Loss of interest	–	Questionnaire
Tjong et al. [41]	25	Kinesiophobia, Psychological motivators, Advancing age, Social support, Competing interest	–	Semi-structured telephone interviews
Vascellari et al. [42]	66	–	TSK	Questionnaire

No. number of patients; *RTS* return to sports; *SIRSI* shoulder instability-return to sport after injury; *TSK* Tampa scale for kinesiophobia

either returned to their previous level of sports participation or did not [42].

Discussion

The primary finding of this systematic review highlights that psychological factors play a substantial role in the RTS after anterior shoulder instability surgery. Specifically, psychological factors were identified as the primary reason for failure to RTSA in 55.9% of the athletes analysed in this review. These findings are consistent with previous elbow and knee research, which identified psychological factors as one of the main obstacles for athletes to RTS after medial ulnar collateral ligament or anterior cruciate ligament reconstruction [7, 27]. In those studies, an important proportion of patients (40.4 and 64.7%, respectively) attributed their failure to RTS to psychological factors [7, 27].

As patients with anterior glenohumeral instability are increasingly treated with shoulder stabilisation procedures, RTS has become an important outcome metric[30]. However, RTS rates vary widely between these procedures [1, 15, 21]. The RTSA for patients undergoing Bankart repair or Latarjet procedure ranged from 83.6 to 97.5% in 609 athletes, whereas it ranged from 60 to 100% in 736 patients treated with Bankart repair combined with the Remplissage, according to two systematic reviews [1, 16]. This study found an overall RTSA of 79.3% (range, 53–100%) among 654 eligible patients.

Recently, non-physical variables have been increasingly acknowledged as important in successful RTS after shoulder stabilisation surgery [36, 37, 41]. Tjong et al. conducted semi-structured qualitative interviews with 25 athletes who had undergone anterior shoulder stabilisation surgery, showing that patients' decision not to RTS was influenced by various psychological factors, not just perceived shoulder function [41]. Their qualitative analysis revealed intrinsic patient-derived themes such as kinesiophobia, psychological motivators and extrinsic themes, including competing interests, social support and advancing age [41].

While improvements in pain and quality of life can occur following treatment of a shoulder dislocation, kinesiophobia may persist and impact patients' overall well-being after one year [28]. Feng et al. found that nearly 50% of patients who did not RTS after Bankart repair had nonobvious functional or motion abnormalities. Instead, RTS rates were negatively correlated with fear of reinjury but not with age at surgery, age at initial instability, duration of symptoms or the number

Table 4 Psychological factors and failure to return to sports

	No. of cases	Percentage %	No. of studies
Failure to return to sports			
Failure to RTSA, sample = 823	247	30	9 [17, 19, 20, 23, 26, 34, 36–38]
Failure to RTSA due to Psychological Reasons, sample = 247	138	55.9	9 [19, 20, 23, 26, 34, 36, 37]
Failure to RTSP due to Psychological Reasons, sample = 19	6	31.6	2 [17, 38]
Psychological reasons for failure to RTSA, sample = 138			
Kinesiophobia (*I*)	74	53.6	5 [22, 26, 36, 37]
Fear of reinjury	68	49.3	4 [22, 26, 36, 37]
Concern about new rehabilitation process	6	4.3	1 [37]
Psychological motivators (*I*)	27	19.6	5 [19, 20, 34, 36]
Loss of confidence	3	2.2	4 [19, 20, 36]
Loss of Interest	5	3.6	4 [19, 20, 34]
Personal values	19	13.2	2 [19, 20]
Competing interest (*E*)	36	26.1	4 [19, 20, 36, 37]
Change in priorities and personal interest	29	21	3 [19, 20, 37]
Lack of time	7	5.1	2 [36, 37]
Advancing age (*E*)	1	0.7	1 [36]
Psychological reasons for failure to RTSP, sample = 6			
Kinesiophobia (*I*)	2	33	1 [17]
Anxiety to play	2	33	1 [17]
Psychological motivators (*I*)	4	66	5 [38]
Loss of confidence	3	49	4 [38]
Loss of interest	1	17	4 [38]

I intrinsic forces; *E* extrinsic influences; *No.* number; *SD* standard deviation; *RTSA* return to sports at any level; *RTSP* return to sports at the pre-injury or higher level; *Sample* sample size of patients analysed

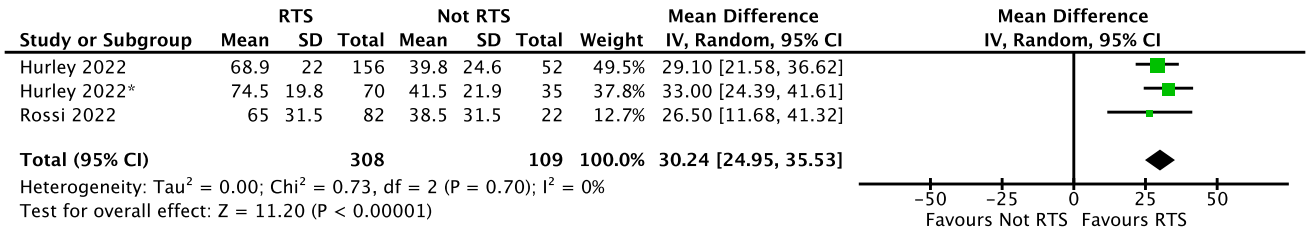

Fig. 2 Random-effects model showing mean differences in Shoulder Instability-Return to Sport after Injury (SIRSI) score between patients who did return to sports (RTS) and those who did not return to sports (Not RTS). *Hurley et al. (2022) Orthop J Sports Med

of preoperative dislocations. Anxiety about being unable to perform at preinjury levels and not appearing athletic can also affect successful RTS [14]. This systematic review demonstrated that kinesiophobia (74 athletes) and, specifically, fear of reinjury (68 athletes) were the psychological factors most frequently reported by athletes for non-RTS after shoulder instability surgery, with concerning prevalence rates of 53.6% and 49.3% among those who did not return.

The results of this review also indicated that 21.5% of the patients who did not RTS cited psychological drivers such as loss of confidence, loss of interest, and personal values as causes of not returning to sports. Tjong et al. found that patients who returned to sports felt more confident from rehabilitation to the first game, while those who did not return felt incompetent or unconfident [41]. We found that 37 (25.7%) athletes identified extrinsic factors such as competing interests and advancing age as psychological reasons for not returning to sports after anterior shoulder instability surgery. Moreover, the patient-derived theme "competing interests" was reported as the most important extrinsic factor impacting RTS [41], matching our findings. In addition, 6 of the 19 athletes evaluated (32%) did not RTSP, primarily for psychological reasons.

The second key finding from the current meta-analysis was that patients who returned to sports had significantly higher psychological readiness scores. The SIRSI

score, an adaptation from a test in ACL reconstructions, is a valid and reproducible scale that measures psychological readiness for athletes to RTS after shoulder instability and quantify the psychological readiness of athletes to RTS after conservative or surgical management of anterior shoulder instability [15]. The SIRSI scale measures emotions, performance confidence, fear and risk of reinjury, and rehabilitation and surgery, which have been shown to have high internal consistency [29].

Psychological readiness for RTS after conservative or surgical treatment has yielded inconsistent results. Olds et al. found no difference in total SIRSI between those who returned to sport (48.4 ± 19) and those who did not (44.1 ± 15). In contrast, Gerometta et al. showed significant differences in SIRSI between patients who returned to rugby and those who did not (60.9 ± 26.6 vs. 38.1 ± 25.6, $P = 0.001$). However, we pooled data from three comparative studies [19, 20, 36] that analysed the psychological readiness of 417 surgically treated athletes and showed statistically significantly higher SIRSI scores ($P < 0.00001$) in those who achieved RTS (MD = 30.24 (95% CI:24.95–35.53; $I^2 = 0\%$; n.s.). Similarly, results from a case series of 217 patients undergoing the Latarjet procedure showed a positive association between RTS, preoperative ROWE and SIRSI scores in a multivariate analysis [4].

RTSP is a critical indicator of athlete recovery [1]. Our analysis of 658 patients found a rate of RTSP of 61.9%, similar to a previous review that included several surgical techniques [21]. Rossi et al. found an association between the SIRSI score and the play level [36]. Their regression model indicated that RTSP was more likely as the SIRSI score increased, using a cut-off level of 55 to evaluate whether an athlete was psychologically ready to return to the preinjury sports level. They also found that for every 10-point increase in the SIRSI score, the probability of RTSP increased 11.7 times [36].

Although this study was conducted using a rigorous and reproducible search strategy and methodology and represents the first systematic review and meta-analysis addressing the effect of psychological factors on RTS after shoulder instability surgery, several limitations are acknowledged. First, the quality of the research from which the data were obtained affects the current review. Most investigations were retrospective case series or case–control studies, with a level of evidence of 4 or 3. Most studies did not explain or justify patient responses. Second, several studies have mainly investigated the psychological factors that affect RTS, which could have biased the results. Third, the included studies varied in design, patient populations, surgeon experience, surgical techniques, and most importantly, only two publications established criteria for RTS. Fourth, we did not examine the effect of psychology on shoulder function or patient-reported outcomes nor did we examine clinical outcomes other than RTS after surgery. Fifth, although we attempted to collect data for distinct subgroups of athletes, the lack of consistent reporting of outcome measures within uniform cohorts made it challenging to obtain precise outcome measures for subsets of athletes, such as contact athletes or throwing athletes, or by sports discipline. Thus, the external validity of these findings should be cautiously considered.

Additionally, the current literature lies in the absence of standardised assessment tools and specific criteria for evaluating psychological factors individually. To advance this field, future research should employ validated questionnaires and assessment tools to accurately measure these factors and consider integrating the SIRSI score and TSK with patient-reported outcome assessments to provide a robust evaluation of RTS readiness. We advocate multi-institutional studies that recruit and longitudinally evaluate clinical outcomes in more patients and use standardised psychological tests and criteria for RTS, enabling correlation with functional outcomes to design appropriate, multi-professional and timely psychological interventions. Interventions targeting psychological aspects of rehabilitation, such as cognitive-behavioural strategies and motivational interviewing, could play a pivotal role in enhancing RTS rates after shoulder stabilisation surgery.

Conclusions

This systematic review and meta-analysis demonstrated that psychological factors have a substantial impact on the rate of RTS after anterior shoulder instability surgery. Furthermore, patients who returned to sports had significantly higher psychological readiness than those who did not return to sports. Based on these findings, healthcare professionals should be aware of the psychological factors that influence patients' decisions to undergo RTS, such as fear of reinjury, changes in priorities and interests, and personal values, and consider them in conjunction with other functional measures when assessing athletes' readiness to undergo RTS.

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Data availability The data supporting the findings of this study are available within the article and its supplementary materials. This research is a systematic literature review, and as such, it relies on previously published data. The sources of all data used in this study are cited in the references section.

Declarations

Conflict of interest The authors declare that there are no conflicts of interest regarding the publication of this article. There have been no

personal or financial relationships with other people or organizations that could inappropriately influence or bias the content of the study.

Ethical approval As this study is a systematic literature review and does not involve any new studies of human oranimal subjects performed by any of the authors, ethical approval was not required.

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