

Effects of pre-operative patient expectations on the outcome after total shoulder arthroplasty: A systematic review

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Abstract

Aim: To synthesize the evidence considering effects of pre-operative patient expectations on the post-operative outcomes in patients with total shoulder arthroplasty.

Methods: PubMed, Web of Science and Cochrane were searched for relevant studies. Studies before 2000 were excluded. Studies examining effects of pre-operative patient expectations on post-operative outcome in adults who had undergone total shoulder arthroplasty were included if at least one of the following treatment outcomes should have been measured: shoulder function, range of motion, shoulder pain, activities of daily living, muscle strength, patient satisfaction, or quality of life. After screening 875 studies four studies were included. Relevant data was extracted in a standardized way. Quality assessment was performed through QUIPS and EBRO methods. Both were performed by two independent reviewers.

Results: All 4 studies had a high risk of bias and level of evidence B. Moderate evidence was found regarding the absence of an association between greater pre-operative patient expectations and numerous outcome measures. All other associations yielded conflicting or preliminary evidence.

Discussion: Informing patients about what can be expected can be of great importance. Evidence lacking. To confirm or reject the findings of this systematic review, future research should focus on high-quality research with validated research protocols.

Keywords

Arthroplasty, shoulder, replacement, expectations, physical therapy

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Introduction

Shoulder arthroplasty (SA) is a well-known and often performed surgical procedure.^{1,2} The number of SA performed is increasing rapidly^{1–5} and the demand is expected to rise to a 755% increase by 2030.⁶ Despite the overall good outcomes after SA procedures, several patients (up to 25%) still are dissatisfied.⁷ Swarup et al., systematically summarized different factors that were associated with post-operative satisfaction in shoulder surgery, in general. They found that meeting pre-operative expectations, functional improvement, improved general health status, being married, and being employed were significantly associated with post-operative satisfaction.⁸ There is a growing body of evidence that pre-operative patient expectations, referred to as future-directed beliefs that focus on the incidence or no-incidence of a

specific event of experience⁹ and other psychosocial factors, could influence outcomes and satisfaction, in different pathologies.^{8,10–20} The value of pre-operative expectations has well been established in the rehabilitation of total knee and

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total hip arthroplasty^{10–15,21} low back pain,¹⁶ as well as in rotator cuff repair.^{17,18} Most of these studies showed an association between greater pre-operative patient expectations or better fulfilment of pre-operative expectations and improved post-operative outcomes.^{11–13,17,18}

The psychosocial nature of each individual patient, with patients' expectations as an intrinsic part, could be of influence in the treatment plan and eventually impact the outcome of post-operative rehabilitation. Doctors and physiotherapists could have a huge impact and change imprecise beliefs about a problem or pathology, reduce anxiety, and thereby increase self-efficacy, and fighting depression. If physiotherapists could recognize these opportunities and develop the skills to change these psychosocial issues, both therapists and patients could benefit.²²

In this context, pre-operative expectations of patients undergoing shoulder surgery could also affect both the decision in therapy plan and how patients perceive their post-operative status.²³ Identifying the effect of these pre-operative expectations in SA is of great value in preparing the patient for surgery and improving satisfaction with outcomes.^{10–16,21} To improve patient satisfaction, straightforward and well-considered clinician-patient communication might help to set the expectations to the right terms.²¹

Despite the literature considering pre-operative expectations and their effects on the post-operative outcome in other pathologies and its great importance, to our knowledge, no systematic reviews exist in the SA population. Therefore, the aim of this systematic review was to summarize the available evidence regarding the effects of pre-operative patient expectations on post-operative outcome such as: shoulder function, range of motion, shoulder pain, ADL, muscle strength, patient satisfaction, or QOL in patients with SA.

Materials and methods

This systematic review is conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Checklist (PRISMA)²⁴ and is registered in PROSPERO (CRD42020140594).

Information sources and search

The search strategy was based on a Patient, Intervention, Comparison, Outcome, and Study design (PICOS) design. A systematic search was performed within PubMed, Web of Science (WOS), and Cochrane Trials Library to identify relevant articles concerning pre-operative expectations, attitudes, perceptions, or beliefs (I) and its effect on the post-operative outcome (O) in patients with a SA (P). Free-text words and MeSH-terms were both used to conduct an exhaustive search. The search strategy can be found in the Supplemental Appendix. The last search was carried out on 13 November 2023. The same search query

was used for all databases and no limits were set. Reference lists of all included studies and relevant systematic reviews were checked for additional relevant articles.

Eligibility criteria

To be included in this systematic review, studies had to be original research assessing pre-operative expectations, attitudes, perceptions, or beliefs (I) and its influence on treatment outcome (O) in human adults of whom at least 80% had undergone a SA (P). At least one of the following treatment outcomes should have been measured: shoulder function, pain, muscle strength, range of motion, proprioception, satisfaction, QOL or ADL. Systematic reviews, meta-analysis, case reports and series, expert opinions, clinical protocols, letters to the editor, short communications, congress abstracts and proceedings, and books were excluded. Studies were also excluded if no full text was available or when it was written in another language than English, Dutch, French, and German. Studies published before 2000 were also excluded to avoid including studies with outdated implant types. The hierarchical order of the eligibility criteria was as follows: 1) language; 2) study design; 3) patients (P); 4) intervention (I); 5) outcome (O).

Study selection

All articles identified in this systematic search were imported in EndNote X9 and duplicates were removed. The retrieved articles were transferred into Rayyan²⁵ for two screening phases, on title and abstract. The results of the systematic search were screened for relevant publications by two independent, blinded researchers (ADM and AC). If title and abstract were unclear regarding eligibility criteria, the full text was retrieved, and screened together with the remaining articles. The second screening phase, based on full text, followed the same procedure. When consensus could not be reached, the last author (FS) was contacted for final decision.

Methodological quality

Risk of bias assessment of all included studies was performed using the Quality In Prognosis Studies (QUIPS) tool.²⁶ The tool consists of signaling questions to determine the risk of bias in studies concerning prognostic factors. The different domains being assessed are: 1) study participation; 2) study attrition; 3) prognostic factor measurement; 4) outcome measurement; 5) study confounding; 6) statistical analysis and reporting. Each domain is rated as low, moderate, or high risk of bias. The overall score is based on the risk of bias for each of those domains and based on the method in other tools.^{27,28} A study is considered to have a high risk of bias if at least one domain is at high risk of bias. A study is at moderate risk of bias if at least one domain is at moderate risk, but none is at high risk,

and a study is at low risk of bias if all domains are at low risk.

Level of evidence of each study was determined based on the Evidence Based Richtlijn Ontwikkeling (EBRO) checklist.²⁹ Five different levels ranging from A1 (highest) to D (lowest) could be applied.

Finally, results were analyzed and existing evidence regarding the influence of pre-operative expectations on post-operative outcome was summarized. All effects were provided with a final level of conclusion, again, based on the EBRO method.²⁹ To facilitate readability of results, these levels of conclusion were converted. Outcomes were provided with a level 1 of conclusion if one A1 or at least two A2 articles agreed on the results, this was converted into strong evidence. Level 2 of conclusion was provided if one A2 or at least two B articles agreed on the results, which was named moderate evidence. Level 3 of conclusion was awarded if one B article (converted to preliminary evidence) or at least two C articles agreed on the results (converted to low evidence). An outcome was provided level 4 of conclusion if one C article agreed on the results (converted to preliminary evidence) or more than one higher level article did not support each other's findings (converted to conflicting evidence).²⁹

Methodological quality assessment was carried out by the same two independent reviewers (ADM and AC) and results were compared. In case of disagreement, the last author (FS) was contacted.

Data extraction

Two independent reviewers (ADM and AC) extracted the data using a standardized data-extraction file. Information regarding study design, characteristics of participants, inclusion and exclusion criteria, outcome measures, timing, pre-operative factors (expectations, attitudes, perceptions, or beliefs), and their effects were collected.

No meta-analysis was planned due to the heterogeneity of the outcome measures in the included studies. Only a qualitative analysis will be done.

Results

Selection of studies

The selection process of this systematic review can be found in Figure 1. In the end, four articles were included in this systematic review, two of them were retrospective cohort studies,^{30,31} and two were prospective cohort studies.^{32,33} Characteristics of included studies are presented in Table 1.

Methodological quality

The methodological quality of included studies is presented in Table 2. The overall risk of bias of the included studies

was high in all four studies. This was mainly due to study attrition. The initial agreement between the 2 reviewers for risk of bias assessment was 83%, which reached full agreement after discussing the differences. The last author did not need to be consulted. The level of evidence was at level B for all studies. Levels of conclusion are presented in Table 3 and 4.

Study population

All patients in the included studies had undergone a TSA (N = 797), either an ATSA (N = 162),^{31,33} or a RTSA (N = 199),^{30,33} and in 436 patients it was unclear whether they had undergone an ATSA or a RTSA.³⁴ The average age of the included patients was 68,5 years old, ranging from 30 to 91,4 years old. The number of women in the included studies varied from 57 to 194 (45–65%), while the number of men varied from 41 to 242 (35–56%). Different indications for surgery were seen. In patients with ATSA, the indication was primary glenohumeral osteoarthritis with failure of non-operative management.^{31–33} In patients with RTSA, indications were arthropathic cuff tears, degenerative arthritis, post-traumatic arthritis or glenohumeral osteoarthritis.^{30,32,33}

Pre-operative expectations

Three of the four studies used the validated Hospital for Special Surgery's Shoulder Expectations Survey (HSS-ES) to assess pre-operative expectations.^{30,31,33} This survey includes 19 expectations related to the shoulder of the patient and the outcome after surgery. The main question is: "How important are these expectations in the treatment of your shoulder?". Each expectation has five possible answers on an ordinal scale: "very important", "somewhat important", "a little important", "I do not expect this", and "this does not apply to me". For each question, certain responses were extracted: the "very important" responses, were seen as a high level of expectation or greater expectations. For each patient the total number of questions marked as "very important" were summed.^{30,31,33} Greater expectations in general, were a greater number of "very important" responses. In other words, a patient with greater expectations is a patient who expects more of the post-operative outcome. All three of these studies also analyzed the separate expectation questions and their responses.^{30,31,33} At last, two of the three studies also analyzed the role of pre-operative patient expectations as an independent predictor for outcome measures.^{30,31}

The fourth included study used a different method to measure patient's pre-operative expectations. Patients were asked the level of functional activity they expected to be able to perform after their SA on an ordinal scale of five items: perform self-care, work outside the house, perform light exercise, perform heavy exercise, or

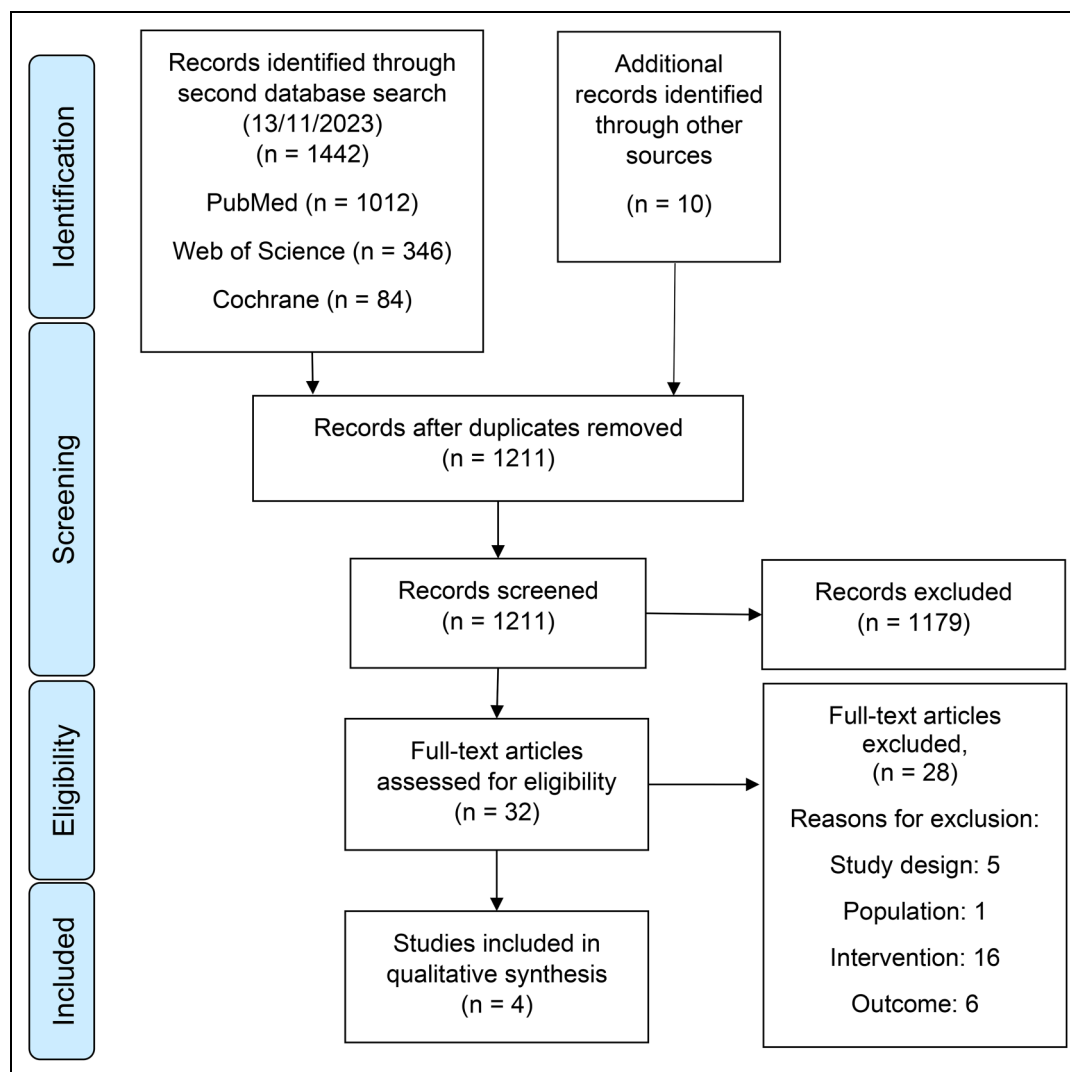


Figure 1. Flowchart of systematic literature review. FT: full text.

participate in sports. After choosing one functional activity, patients were asked to rate their level of confidence in their ability to attain their previously stated desired level of post-operative functionality on a scale from 0 (no confidence) to 10 (very confident).³⁴

Outcome measures

Outcome measures used in the included studies varied substantially. To measure shoulder function the American Shoulder and Elbow Surgeons Score (ASES),^{30,31,33} which measures the functional limitations of the affected shoulder, the Simple Shoulder Test (SST)³³ for functional limitations of the effected shoulder, the Single Assessment Numeric Evaluation (SANE)³³ for functionality of the affected shoulder, and the Penn Shoulder Score (PSS)³⁴ which assesses patient self-reported levels of pain, function and satisfaction were used. Health related

QOL was measured by the Short Form-36 (SF-36),^{30,31} the Short Form-12 (SF-12),³⁴ and the Veterans RAND 12-Item Health Survey (VR-12).³³ To measure level of shoulder activity (how often a patient engages in activity with the shoulder) the Shoulder Activity Scale (SAS)^{30,31} was used. Pain, fatigue, and general health were assessed through the Visual Analogue Scale (VAS).^{30,31,33} To measure satisfaction, satisfaction was first rated considering five domains (overall, pain, work, activities, QOL) with five possible answers: “very satisfied”, “somewhat satisfied”, “neither satisfied, nor dissatisfied”, “somewhat dissatisfied” and “very dissatisfied”. For analysis, these responses were dichotomized, “very satisfied” responses versus all other responses called “not very satisfied” responses. Secondly, three yes or no questions were asked: “Would you choose to undergo the surgery again?”, “Would you recommend the surgery to a friend?”, and “Do you wish you had undergone the surgery earlier?”^{31,33}

Table 1. Characteristics of the studies investigating the effect of pre-operative expectations, attitudes, and beliefs on treatment outcome after shoulder arthroplasty.

Participants								
Source	Study design	Group composition and patient characteristics	Inclusion	Exclusion	Pre-op expectations	Outcome measures	Timing/follow up	Results
Lawrence et al. 2021 ³³	Prospective cohort	ATSA N=64 ♀ 22 (34%) ♂ 42 (66%) 65.7y (36.6y-86.3y) RTSA N=64 ♀ 41 (64%) ♂ 23 (36%) 71.4y (51.1y-91.4y)	Patients undergoing primary ATSA for a diagnosis of OA and RTSA for the diagnosis of CTA	Patients undergoing revision surgery, a history of prior shoulder arthroplasty, and other diagnoses, such as avascular necrosis, proximal humerus fracture, or inflammatory arthropathy	HSS-ES	-Shoulder function (ASES, SANE, SST) -Pain (VAS) -General health (VR-12) -Satisfaction (questionnaire) -aROM (FF)	-Pre-op -2y FU	Greater expectations for ability to exercise: - More impr shoulder function (ASES) in patients with ATSA - More impr shoulder function (SANE) in patients with ATSA No association between pre-op expectations and any of the other improvement or outcome scores in patients with ATSA or RTSA
Rauk et al. 2018 ³⁰	Retrospective cohort	RTSA N=135 (137 RTSA's) ♀ 88 (65%) ♂ 47 (35%) 71.4y	None reported	None reported	HSS-ES	-Shoulder function (ASES) -Level of shoulder activity (SAS) -Health related QOL (SF-36) -Shoulder pain (VAS) -Fatigue (VAS) -Overall illness and health (VAS)	-Pre-op -2y FU	Greater number of "very important" expectations showed statistically significant -More impr: in SF-36 physical function - More impr: in SF-36 role physical - More impr: in SF-36 general health score Greater expectations for less night pain: - Better shoulder function (ASES) - Less shoulder pain (VAS) Greater expectations for impr: the ability to participate in non-overhead sports: - More shoulder activity (SAS) No association with any of the other improvement or outcome scores A greater number of "very important" expectations was not an independent predictor of ASES, SAS, or VAS scores
Syron et al. 2015 ³⁴	Prospective cohort	Primary TSA N=436 ♀ 194 (45%) ♂ 242 (55%) 66.6y	Patients undergoing a primary unilateral TSA between January 2008 and December 2010	Patients having another surgery within 3 m before or after the index shoulder arthroplasty procedure Patients not having completed a baseline questionnaire within 6 months before the index shoulder arthroplasty Patients not completing a single FU questionnaire post-operative	Patients were asked the level of functional activity they expected to achieve after their TSA on an ordinal scale of 5 items: perform self-care, work outside the house, perform light exercise, perform heavy exercise, or participate in sports. Patients were asked on a scale of 1 to 10 to rate their level of confidence in their ability to attain their desired level of postoperative functionality.	-Shoulder function (PSS) -Health related QOL (SF-12)	-Pre-op -6 m FU	Patients' confidence scores were significantly associated with the amount of impr in their post-op functionality: - More confident patients = larger impr: in PSS-function - More confident patients = larger impr: in PSS-pain Greater confidence did not have a significant effect on the patient's impr in the SF-12 PCS score
Swarup et al. 2017 ³¹	Retrospective cohort	ATSA N=98 (67 included) ♀ 57 (58%) ♂ 41 (42%)	- Patients who had undergone a unilateral primary ATSA - Patients who had	None reported	HSS-ES	-Shoulder function (ASES) -Level of shoulder activity (SAS)	-Pre-op -2y FU	Greater number of "very important" expectations: - Greater impr in shoulder function (ASES) No association with any of the other

(continued)

Table 1. Continued

Source	Study design	Participants	Group composition and patient characteristics	Inclusion	Exclusion	Pre-op expectations	Outcome measures	Timing/follow up	Results
		67.6y (30y-86y)		<ul style="list-style-type: none"> completed pre-op data about expectations - Patients who had 2y outcome data 			<ul style="list-style-type: none"> -Health related QOL (SF-36) -Shoulder pain (VAS) -Fatigue (VAS) -Overall illness and health (VAS) -Satisfaction (questionnaire) 		<ul style="list-style-type: none"> improvement scores or any of the outcome's scores at 2y FU Greater expectations for relieving daytime pain: <ul style="list-style-type: none"> - Greater impr in shoulder function (ASES) - Greater impr in SF-36 general health Greater expectations for improving shoulder ROM: <ul style="list-style-type: none"> - Greater shoulder function (ASES) - Less shoulder pain (VAS) - Greater impr in level of activity (SAS) Greater expectations for stopping the shoulder from dislocating <ul style="list-style-type: none"> - Greater 2y FU and impr in SF-36 role physical - Greater 2y FU and impr in SF-36 bodily pain - Less shoulder pain (VAS) Greater expectations for improving the ability to carry objects over 4.5kg: <ul style="list-style-type: none"> - Greater 2y FU and impr in shoulder function (ASES) Greater expectations for improving the ability to reach above shoulder level: <ul style="list-style-type: none"> - Greater 2y FU and greater impr in shoulder function (ASES) - Less shoulder pain (VAS) Greater expectations for improving self-care: <ul style="list-style-type: none"> - Greater 2y FU and greater impr in shoulder function (ASES) Greater expectations for being employed for monetary reimbursement: <ul style="list-style-type: none"> - Greater SF-36 mental health Greater expectations for improving psychological well-being: <ul style="list-style-type: none"> - Greater impr in shoulder pain (VAS) - Greater impr in SF-36 social function Greater expectations for improving the ability to interact with others: <ul style="list-style-type: none"> - Greater impr in shoulder pain (VAS) - Greater impr in SF-36 social function Greater expectations for improving the ability to perform daily activities: <ul style="list-style-type: none"> - Greater 2y FU and impr in shoulder pain (VAS) - Greater impr in SF-36 physical function - Greater impr in SF-36 vitality Greater expectations for improving the ability to exercise or participate in professional sports: <ul style="list-style-type: none"> - Greater 2y FU and impr in SF-36 bodily pain - Greater in SF-36 social function - Greater in SF-36 mental health - Greater impr in shoulder function (ASES) Greater expectations for improving the ability to participate in non-overhead sports: <ul style="list-style-type: none"> - Greater impr in shoulder activity (SAS)

(continued)

Table 1. Continued

Participants		Pre-op expectations	Outcome measures	Timing/follow up	Results
Source	Study design	Group composition and patient characteristics	Inclusion	Exclusion	
					<p>One specific expectations question was associated with a satisfaction question: patients who indicated it was "very important" to improve the ability to perform daily activities were more likely to have wanted their surgery to be performed earlier (p = 0010)</p> <p>Greater number of "very important" expectations was an independent predictor of:</p> <ul style="list-style-type: none"> - Higher shoulder function (ASES) - Less shoulder pain (VAS) - Better VAS fatigue - Better VAS general health - Higher SF-36 physical function - Higher SF-36 bodily pain - Higher SF-36 vitality - Greater impr in shoulder function ASES - Greater impr in VAS pain

ATSA: Anatomic Total Shoulder; N: total; ♀: women; ♂: men; y: year; RTSA: reverse total shoulder arthroplasty; OA: osteoarthritis; CTA: cuff tear arthropathy; HSS-ES: Hospital Special Surgery Shoulder-Expectation Survey; ASES: American Shoulder and Elbow Score; SANE: Single Assessment Numeric Evaluation; SST: Simple Shoulder Test; VAS: Visual Analogue Scale; VR-12: Veteran RAND 12-item Health Survey; aRO%: FF: forward flexion; pre-op: pre-operative; FU: follow-up; impr: improvement; SAS: Shoulder-Activity Score; QOL: quality of life; SF-36: Short Form 36; SF-12: Short Form 12; TSA: Total Shoulder Arthroplasty; PSS: Penn Shoulder Score; m: month; PCS: Physical Component Score.

Table 2. Risk of bias and level of evidence of the included studies.

QUIPS	1	2	3	4	5	6	Overall RoB	LOE
Lawrence et al. 2021 ³³	Low	High	Moderate	Low	Moderate	Moderate	High	B
Rauck et al. 2018 ³⁰	High	High	Low	Low	Moderate	Low	High	B
Styron et al. 2015 ³⁴	Low	Low	High	Moderate	Moderate	Low	High	B
Swarup et al. 2017 ³¹	High	High	Low	Low	Moderate	Low	High	B
1 Study participation								
2 Study attrition								
3 Prognostic factor measurements								
4 Outcome measurement								
5 Study confounding								
6 Statistical analysis and reporting								
LOE: level of evidence								
RoB : Risk of bias								

Table 3. Associations between pre-operative patient expectations and better 2y follow-up outcome scores, pre-operative patient expectations and improvement outcome scores (pre-op – 2y fu), and their evidence.

Associations between greater expectations and better 2y follow-up scores					
	Rauck et al., 2018 ³⁰	Swarup et al., ³¹	Lawrence et al., ³³	Styron et al., ³²	Evidence
Shoulder function (ASES score)	O	O	O		Moderate
Shoulder function (SST)			O		Preliminary
Shoulder function (SANE)			O		Preliminary
Level of shoulder activity (SAS score)	O	O			Moderate
Shoulder pain (VAS)	O	O	O		Moderate
Fatigue (VAS)	O	O			Moderate
General health (VAS)	O	O			Moderate
General health (VR-12)			O		Preliminary
QOL (SF-36 physical function)	O	O			Moderate
QOL (SF-36 role physical)	O	O			Moderate
QOL (SF-36 bodily pain)	O	O			Moderate
QOL (SF-36 general health)	+	O			Conflicting
QOL (SF-36 vitality)	O	O			Moderate
QOL (SF-36 social function)	O	O			Moderate
QOL (SF-36 role emotional)	O	O			Moderate
QOL (SF-36 mental health)	O	O			Moderate
Satisfaction		O	O		Moderate
Associations between greater expectations and improvement scores (pre-op – 2y FU)					
	Rauck et al., ³⁰	Swarup et al., ³¹	Lawrence et al., ³³	Styron et al., ³⁴	Evidence
Shoulder function (ASES score)	O	+	O		Conflicting
Shoulder function (SST)			O		Preliminary
Shoulder function (SANE)			O		Preliminary
Level of shoulder activity (SAS score)	O	O			Moderate
Shoulder pain (VAS)	O	O	O		Moderate
Fatigue (VAS)	O	O			Moderate
General health (VAS)	O	O			Moderate
General health (VR-12)			O		Preliminary
Shoulder pain and function (PSS)				+	Preliminary
QOL (SF-12, PCS)				O	Preliminary
QOL (SF-36 physical function)	+	O			Conflicting
QOL (SF-36 role physical)	+	O			Conflicting
QOL (SF-36 bodily pain)	O	O			Moderate
QOL (SF-36 general health)	O	O			Moderate
QOL (SF-36 vitality)	O	O			Moderate
QOL (SF-36 social function)	O	O			Moderate
QOL (SF-36 role emotional)	O	O			Moderate
QOL (SF-36 mental health)	O	O			Moderate
Satisfaction		O	O		Moderate

Table 4. Greater expectations as independent predictor for 2-year follow-up scores and improvement scores (pre-op – 2y fu), and their evidence.

Greater expectations as independent predictor for 2-year follow-up scores			
	Rauck et al. 2018 ³⁰	Swarup et al. ³¹	Level of conclusion
Shoulder function (ASES score)	o	+	Conflicting
Level of shoulder activity (SAS score)	o	o	Moderate
Shoulder pain (VAS)	o	+	Conflicting
Fatigue (VAS)	o	+	Conflicting
General health (VAS)	o	+	Conflicting
QOL (SF-36 physical function)		+	Preliminary
QOL (SF-36 role physical)		o	Preliminary
QOL (SF-36 bodily pain)		+	Preliminary
QOL (SF-36 general health)		o	Preliminary
QOL (SF-36 vitality)		+	Preliminary
QOL (SF-36 social function)		o	Preliminary
QOL (SF-36 role emotional)		o	Preliminary
QOL (SF-36 mental health)		o	Preliminary
Greater expectations as independent predictor for improvement scores (pre-op – 2y FU)			
	Rauck et al. ³⁰	Swarup et al. ³¹	Level of conclusion
Shoulder function (ASES score)		+	Preliminary
Level of shoulder activity (SAS score)		o	Preliminary
Shoulder pain (VAS)		+	Preliminary
Fatigue (VAS)		o	Preliminary
General health (VAS)		o	Preliminary
QOL (SF-36 physical function)		o	Preliminary
QOL (SF-36 role physical)		o	Preliminary
QOL (SF-36 bodily pain)		o	Preliminary
QOL (SF-36 general health)		o	Preliminary
QOL (SF-36 vitality)		o	Preliminary
QOL (SF-36 social function)		o	Preliminary
QOL (SF-36 role emotional)		o	Preliminary
QOL (SF-36 mental health)		o	Preliminary

Effects of pre-operative expectations on outcome

Greater pre-operative patient expectations, defined as a greater number of “very important” responses on the HSS-ES, showed some associations, which can be found, together with their evidence, in Table 3. Associations were awarded as + (positive association), o (no association), and – (negative association).

Moderate evidence was found for no association between greater pre-operative patient expectations or, a greater number of “very important” responses on the HSS-ES, and better 2-year follow-up scores, and improvement scores in patients with both ATSA and RTSA.^{30,31,33}

Conflicting evidence was found for the association between greater pre-operative patient expectations and the 2-year follow-up score for quality-of-life general health, the improvement scores for quality-of-life physical function, quality of live role physical in patients with RTSA, and the improvement score for shoulder function in patients with ATSA. Where one study found a positive association,^{30,31} another study did not find any association.^{30,31} At last, preliminary evidence was found for no association between greater pre-operative patient expectations and the

follow-up scores or improvement scores for different outcome measures.^{32,33}

Considering the fourth study, which is awarded preliminary evidence, higher confidence in achieving physical activities postoperatively showed larger improvements in function and pain scores, measured with PSS. No significant associations were found between confidence and health related QOL.³⁴ However, this study did not directly assess patient’s expectations except for asking the level of activity the patient hoped to achieve. This was weakly but significantly associated with the patient’s confidence levels in the univariate model, but not in the multivariate model.

Moderate evidence was found for greater expectations or, a greater number of “very important” responses on the HSS-ES, not to be an independent predictor for level of shoulder activity.^{30,31} In patients with ATSA, greater pre-operative expectations, was an independent predictor for different outcome measures, such as: better outcome scores at 2-year follow-up for QOL physical function, bodily pain, and SF-36 vitality and greater improvements in shoulder function and shoulder pain, which was all rewarded with preliminary evidence.³¹ Conflicting evidence exists for greater pre-

Table 5. Continued.

Associations between separate expectations questions and improvement scores																											
	ASES score			SANE score	SST	SAS score		VAS shoulder pain		VAS fatigue	VAS general health	VR-12	SF-36 physical function		SF-36 role physical		SF-36 bodily pain		SF-36 general health		SF-36 vitality		SF-36 social function		SF-36 role emotional		SF-36 mental health
	30	31	31	31	31	30	31	30	31	30,31	30,31	31	30	31	30	31	30	31	30	31	30	31	30	31	30,31	30,31	
1	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	+	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0
12	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0
13	0	0	0	0	0	0	0	0	+	0	0	0	0	+	0	0	0	0	0	0	0	0	+	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	+	+	+	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

demonstrates the high need for qualitative research regarding this topic.

In general, moderate evidence was found for only the absence of associations between pre-operative patient expectations and post-operative outcomes in patients with either an ATSA or a RTSA. A few studies showed preliminary evidence of improved outcomes in patients with greater expectations, or patients who expected more; however, some results were conflicting.^{30,31} The predictive character of pre-operative patient expectations and its influence on post-operative outcomes was analyzed in the included studies, which mainly yielded preliminary or conflicting evidence. Considering the separate expectation questions analyzed, only moderate evidence was found for the absence of associations. Separate expectations questions analyzed with a positive association were only awarded preliminary and conflicting evidence for their effect on post-operative outcomes. Finally, preliminary evidence was found regarding the effects of confidence on post-operative function.³⁴ Patients who were more confident in achieving physical activities postoperatively showed larger improvements in function and pain scores. The measurement method to measure patient confidence is not validated to our knowledge. This study also did not directly assess pre-operative patient expectations. They asked for the level of activity they hoped to achieve. These results, thus, should be interpreted with caution.

Different reasons can be given for the conflicting evidence in this systematic review. First, the studies that analyzed these associations included different types of SA. Different types of SA are associated with different

indications and different functional outcomes. For example, RTSA has been shown to have good outcomes for pain relief,^{35,36} but due to the change in biomechanics of the shoulder, there might be a ceiling effect in improving the functional outcome scores,³⁰ which could be a reason for the conflicting evidence. When looking at the differences in pre-operative expectations between ATSA and RTSA in these included studies, greater pre-operative expectations were seen in patients with ATSA, and these patients expected better outcomes.^{30,31} Another possible reason for this conflicting evidence is that RTSA is typically used in the elderly,^{1,5,37} and these patients tend to have lower expectations regarding SA outcomes than younger patients.^{23,38} However, these findings cannot be generalized because the differences in pre-operative patients' expectations were not part of the scope of this systematic review. The next possible reason for this conflicting evidence is the variability in measurement methods. Different methods are used to measure shoulder function, which makes generalizability difficult.³⁰⁻³³ Yet another possible reason for this conflicting evidence is the amount of missing data in the study of Rauck et al.; only 10 of 135 patients filled out the SF-36 form at baseline, and at the 2-year follow-up, only 59 SF-36 scores were available.³⁰ These results may thus overrate outcomes. Another note that should be made is the subjectivity of the term "greater expectations". Included articles defined "greater expectations" as a higher number of questions rated "very important" in the HSS-ES. While, in these articles, this number of questions is not objectively defined. Thus, results need to be interpreted with caution.

The main reason for the preliminary evidence found in this systematic review is the lack of qualitative research regarding the effects of pre-operative patient expectations on post-operative outcomes. Different implant types and different research protocols were used, which makes it difficult to generalize findings. The number of included studies was low, and studies regarding this topic are lacking. This points out the great need for high-quality research concerning the pre-operative patient expectations in SA patients and the effects thereof. Future research should focus on high-quality research with validated research protocols. Measurement methods should be used in a standardized manner and confounding factors should be considered carefully.

When the literature found is compared to the literature that exists about the effects of pre-operative expectations in patients with hip and knee arthroplasties a few important notes can be made. The biggest difference is the amount of available evidence. Systematic reviews written about this topic in hip and knee arthroplasties included between eight and twenty-two studies, while we could only include four articles.^{15,39,40} This is in line with the amount of hip and knee arthroplasties performed annually, compared to the amount of shoulder arthroplasties.² When we look more into the included articles we also see a lot of heterogeneity in the studies about pre-operative expectations in patients with hip and knee arthroplasties.¹⁵ It seems that standardized measurement methods and validated research protocols are also needed in research in hip and knee arthroplasties and the expectations of these patients.

This systematic review has multiple strengths. First, an extensive literature search was performed within three different databases. Additionally, the reference lists of included studies and relevant systematic reviews within the topic were checked to ensure that no evidence was missed. Second, the screening of articles in two phases and the scoring of the methodology were performed by two independent reviewers to ensure that no evidence was missed, and the quality of the included studies was determined objectively. The level of evidence was rather low, and risk of bias of included studies was high, which reinforces the need for further research as previously stated. Additionally, data extraction was performed by two independent reviewers to guarantee that the data was extracted objectively and correctly.

Lastly, the primary aim of all included studies was to investigate the effects of pre-operative expectations or their predictive strength. This emphasis reinforces the importance and relevance of the results of this systematic review.

In conclusion, this systematic review demonstrates the urgent need for high-quality research to determine the effect of pre-operative expectations on the post-operative outcomes. Few eligible studies were found, and the levels of evidence were rather low, while the risk of bias was high. This review found mainly moderate evidence for the absence of associations between greater pre-operative expectations and better post-operative outcomes, and any

associations that were found had conflicting or preliminary evidence. Informing patients about what can be expected can be of great importance. To confirm or reject the findings of this systematic review, future research should focus on high-quality research with validated research protocol.

Abbreviations

SA	Shoulder Arthroplasty
TSA	Total Shoulder Arthroplasty
QOL	quality of life
ADL	activities of daily living
ATSA	Anatomic Total Shoulder Arthroplasty
RTSA	Reverse Total Shoulder Arthroplasty
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analysis Checklist
PICOS	Patient, Intervention, Comparison, Outcome, Study design
WOS	Web of Science
QUIPS	Quality in Prognosis Studies
EBRO	Evidence Based Richtlijn Ontwikkeling
HSS-ES	Hospital Special Shoulder Surgery Expectation Survey
ASES	American Shoulder and Elbow Score
SST	Simple Shoulder Test
SANE	Single Assessment Numeric Evaluation
PSS	Penn Shoulder Score
SF-36	Short Form 36
SF-12	Short Form 12
VR-12	Veteran RAND 12-item Health Survey
SAS	Shoulder Activity Score
VAS	Visual Analogue Score

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