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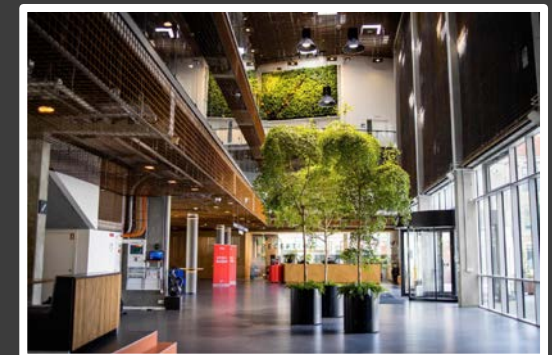
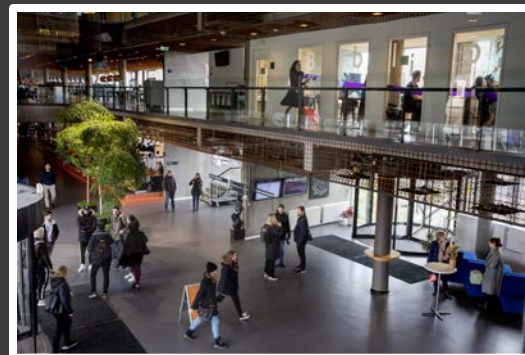


BEHANDLING TIL PATIENTER MED SUBAKROMIELT SMERTESYNDROM (DEL I)

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Associate professor at Aalborg University, Denmark





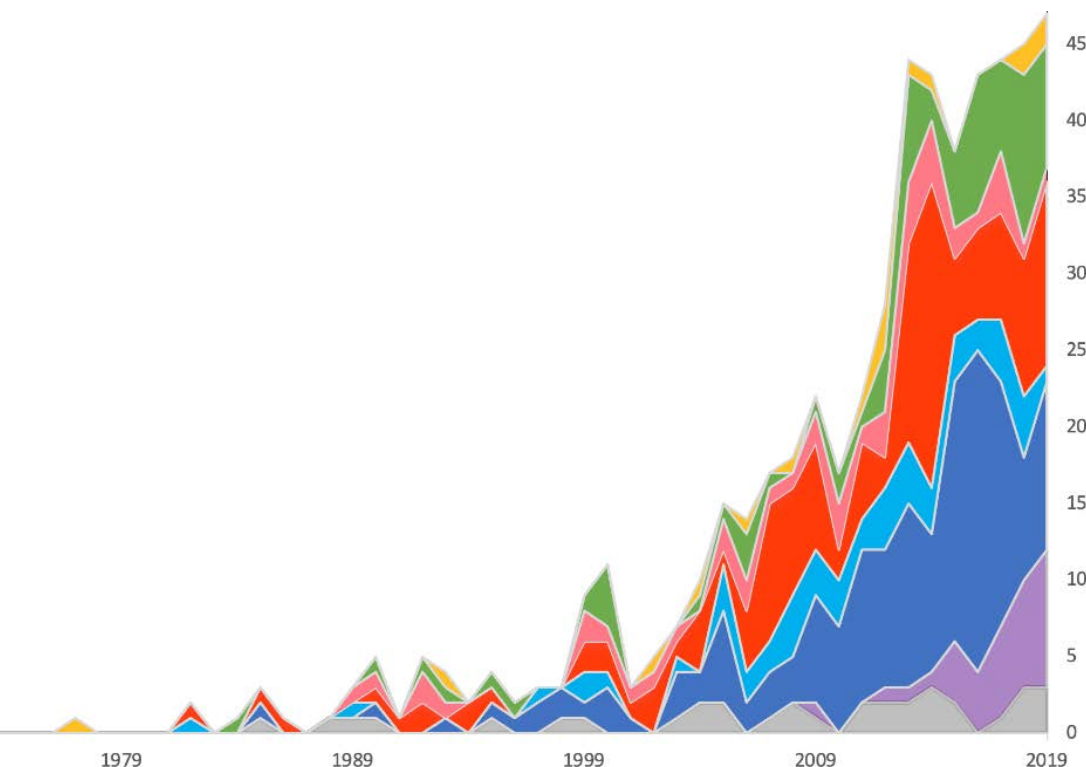
Agenda (part I)

- **The diagnosis**
- **Those who suffer and the consequences**
- **The treatment**
- **The prognosis**
- **Exercise dose and adherence**

The Diagnosis

Terminology and diagnostic criteria used in studies investigating patients with subacromial pain syndrome from 1972 to 2019: a scoping review

Adam Witten ¹, Karen Mikkelsen,¹ Thomas Wagenblast Mayntzhusen ¹,
Mikkel Bek Clausen ², Kristian Thorborg,¹ Per Hölmich ¹,
Kristoffer Weisskirchner Barfod ¹



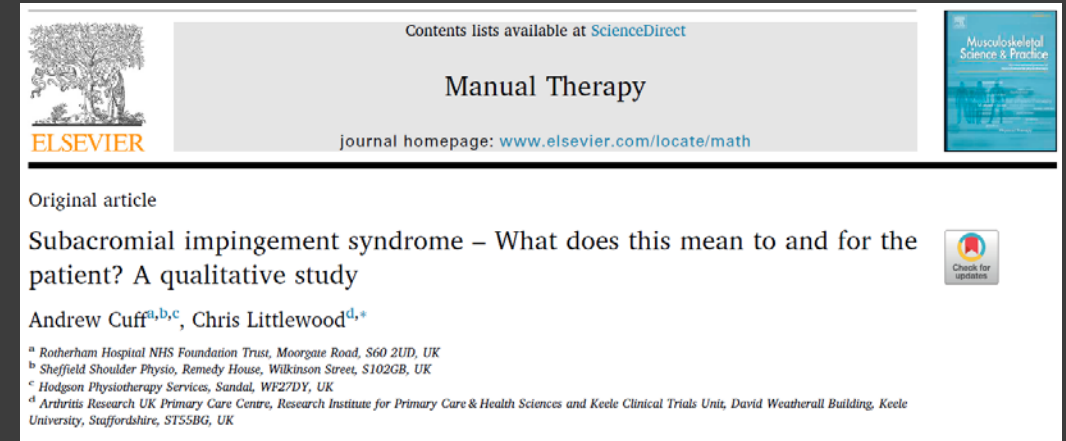
Term	N	%
Impingement (summarised)	454	75
Subacromial impingement syndrome	167	28
Shoulder impingement syndrome	135	22
Subacromial impingement	52	9
Shoulder impingement	43	7
Impingement syndrome	35	6
Impingement	4	1
Rotator cuff impingement	4	1
Chronic impingement syndrome	3	< 1
Rotator cuff impingement syndrome	3	
Subacromial shoulder impingement	2	
Cuff impingement	1	
Internal shoulder impingement	1	
Subacromial impingement disease	1	
Shoulder outlet impingement syndrome	1	
Impingement tendinopathy	1	
Chronic shoulder impingement	1	
Tendinopathy/tendon-related (summarised)	79	13
Rotator cuff tendinopathy	74	12
Supraspinatus tendinitis	4	1
Supraspinatus tendon disease	1	< 1
Pain/disease/syndrome (summarised)	71	12
Subacromial pain syndrome	36	6
Rotator cuff syndrome	16	3
Rotator cuff disease	7	1
Subacromial pain	6	1
Subacromial shoulder pain	3	< 1
Rotator cuff related syndrome	1	
Painful shoulder syndrome	1	
Rotator cuff related shoulder pain	1	

27 unique terms were registered across 535 studies. A total of 604 terms were registered as some studies used more than one term.


What is in a name?

Impact on expectations

Impact on communication



Contents lists available at [ScienceDirect](#)

 **ELSEVIER**

Manual Therapy

journal homepage: www.elsevier.com/locate/math

Musculoskeletal Science & Practice

Original article

Subacromial impingement syndrome – What does this mean to and for the patient? A qualitative study






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^c Hodgson Physiotherapy Services, Sandal, WF22DY, UK
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Check for updates

Implications and recommendations for studies investigating SAPS

We recommend using the term ‘subacromial pain syndrome’ to classify patients with subacromial pain without any identifiable pain-generating factor. The word ‘subacromial pain’ encapsulates the cardinal symptom of SAPS, and the word ‘syndrome’ recognises that the pathophysiology is not fully understood.

Adam Witten ,¹ Karen Mikkelsen,¹ Thomas Wagenblast Mayntzhusen ,¹
Mikkel Bek Clausen ,² Kristian Thorborg,¹ Per Hölmich ,¹
Kristoffer Weisskirchner Barfod ¹

What hides behind the name?

Terminology and diagnostic criteria used in studies investigating patients with subacromial pain syndrome from 1972 to 2019: a scoping review

Adam Witten ¹, Karen Mikkelsen,¹ Thomas Wagenblast Mayntzhusen ¹,
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Table 5 Use of imaging modalities

Modality	To rule in SAPS
Radiograph	6 (1%)
MRI	20 (4%)
Ultrasound	13 (2%)
Arthrography	0
CT	0

Table 2 Physical examination tests and imaging modalities used to diagnose subacromial pain syndrome (patient inclusion criteria)

Name of test	Studies using test
Hawkin's	268 (54%)
Neer's	263 (53%)
Painful arc	155 (31%)
Jobe's	136 (28%)
Isometric external shoulder rotation	104 (21%)
Injection test	75 (15%)
Isometric shoulder abduction	67 (14%)
Pain from palpation of rotator cuff tendon(s)	57 (12%)
Active shoulder elevation pain	29 (8%)
Isometric internal shoulder rotation	21 (6%)
Speed's	11 (2%)
Pain from shoulder apprehension	9 (2%)
Yocum's	8 (2%)
Gerber's	8 (2%)

146 different test combinations

Cross-body adduction	5 (1%)
Lift off	5 (1%)
Patte's (Hornblower's)	5 (1%)
Full can	5 (1%)
Yergason's	3 (1%)
Resisted elbow flexion	2 (<1%)
Shoulder apprehension	2
External shoulder rotation lag sign	1
MRI	31 (6%)
Ultrasound	20 (4%)
Radiograph	10 (2%)

Use of physical examination tests (across 493 studies) and imaging modalities (across 529 studies) to diagnose patients with SAPS. A study can contribute with multiple (or no) tests and imaging modalities.

Statusartikler er oversigtsartikler, der beskriver den nyeste udvikling og forskning inden for et velafgrænset felt af relevans for fysioterapeuter. Artiklerne er typisk igangsat af redaktionen, og forfatterne er forskere med speciale inden for feltet.

Undersøgelse og behandling af subakromialt impingement-syndrom

Der er god evidens for **TRÆNINGSBASERET BEHANDLING** eventuelt i kombination med manuelle teknikker, men det er stadig uklart, hvordan og om en stratificering af patienterne giver nyttig viden til valg af behandling.



AF
MIKKEl BEK CLAUSEN
Fysioterapeut,
cand.scient.san., ph.d.
og docent på
Fysioterapeut-
uddannelsen,
Københavns
Professionshøjskole.

×
Blå bog
Udlærer og
vejleder kliniske
forskningsprojekter med
fokus på at forbedre
rehabiliteringen og har
skulderrehabilitering
som primær forsknings-
område.

SUBAKROMIALT IMPINGEMENTSYNDROM (SIS) er den mest almindelige skulderlidelse og medfører ca. 40.000 nye henvendelser til egen læge hvert år i Danmark.¹ Diagnosen 'subakromialt impingement syndrom' blev først introduceret af Neer² i 1972, som en biomedicinsk forklaring på skuldersmerter. Antagelsen var, at smerten skyldes afklemning af rotatorcuffsennerne mod den anteriore del af akromion og det korakoakromiale ligament. Denne forenklede forklaring er siden da blevet udfordret af nyere evidens, der viser, at en sådan afklemning også kan finde sted hos raske individer. Desuden er der en stigende mængde forskning, der viser, at tilstanden kan behandles uden kirurgisk ændring af akromion og/eller det korakoakromiale ligament.⁴

En mere tidssvarende definition af SIS lyder: skader på strukturer i det subakromiale rum, herunder tendinopati og partielle rupturer i rotatorcuffen samt bursitis³ – uden skelen til mekanismen bag disse. På trods af denne nye definition af SIS er diagnosen stadig genstand for kritik,⁴ blandt andet for brugen af betegnelsen 'impingement'. Betegnelsen anses for problematisk, da den mekanisme, der antydes at være årsag til smerten (afklemning), kan få både patienter, behandlere og forskere til at fokusere på behandlingsformer, der forventes at reducere risikoen for yderligere/fortsat afklemning af subakromiale strukturer (f.eks. subakromial dekompression),⁵ selvom symptomerne kan skyldes andre forhold.

Det er dog væsentligt at huske på, at betegnelsen for diagnosen ikke har indflydelse på, hvilke patienter der diagnosticeres med

Hovedbudskaber

DIAGNOSE

- Diagnosen stilles ud fra en kombination af flere diagnostiske test, f.eks. mindst tre positive ud af følgende: Hawkins-Kennedy test, Neers test, empty can test (Jobes test), udadrotations modstandstest, smertebue.



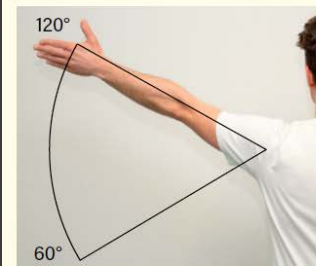
Hawkins test
Scapula fikseres, mens patientens arm flekteres til 90° og indadrotteres. Positiv ved kendte smerter.



Neers test
Scapula fikseres, mens patientens arm løftes til fuld fleksion. Positiv ved kendte smerter.



Empty Can Test
Også kaldet Jobes test. Patientens arme abduceres til 90°, flekteres 30-40° og indadrotteres. Fysioterapeuten presser arm nedefter. Positiv ved kendte smerter.



Smertebue
Patienten abducerer armen. Testen er positiv ved smertemaximum mellem 60 og 120° abduktion.



Udadrotation med modstand
Patienten flekterer albuen 90°. Fysioterapeuten presser armene mod indadrotation, mens patienten forsøger at holde stillingen. Positiv ved kendte smerter.

“Rule out” (when suspected)

- **Glenohumeral osteoarthritis**
- ➔ ▪ **Frozen shoulder**
- ➔ ▪ **Shoulder instability/labral tear**
- **Full-thickness rotator cuff tears**
- **Neurological and cervical disorders**








Imaging to “rule out” (when suspected)



Table 5 Use of imaging modalities

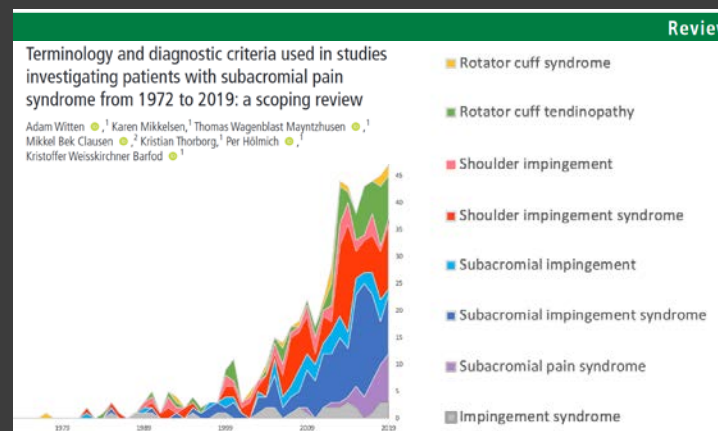
Modality	To rule in SAPS	To exclude other pathology	To rule in SAPS, and to exclude other pathology	Purpose not specified	Total
Radiograph	6 (1%)	65 (12%)	4 (1%)	79 (15%)	154 (29%)
MRI	20 (4%)	37 (7%)	11 (2%)	75 (14%)	143 (27%)
Ultrasound	13 (2%)	42 (8%)	7 (1%)	71 (13%)	133 (25%)
Arthrography	0	7 (1%)	0	11 (2%)	18 (3%)
CT	0	0	0	3 (1%)	3 (1%)

Studies using a specific image modality to either rule in SAPS, exclude other pathology (such as osteoarthritis, rotator cuff tears and labral injury), or to rule in SAPS and exclude other pathology at the same time. Some studies did not specify the purpose of the image modality. 529 studies were included in the analyses. SAPS, subacromial pain syndrome .

Adam Witten ¹, Karen Mikkelsen,¹ Thomas Wagenblast Mayntzhusen ¹,
Mikkel Bek Clausen ², Kristian Thorborg,¹ Per Hölmich ¹,
Kristoffer Weisskirchner Barfod ¹

Diagnosis

- Terminology
- Clinical tests
- Exclusion
- Imaging



Hawkins test
Scapula fikseres, mens patientens arm flekteres til 90° og indadrotteres. Positiv ved kendte smerter.

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Patienten flekterer albuen 90°. Fysioterapeuten presser armene mod indadrotation, mens patienten forsøger at holde stillingen. Positiv ved kendte smerter.

Those who suffer and the consequences

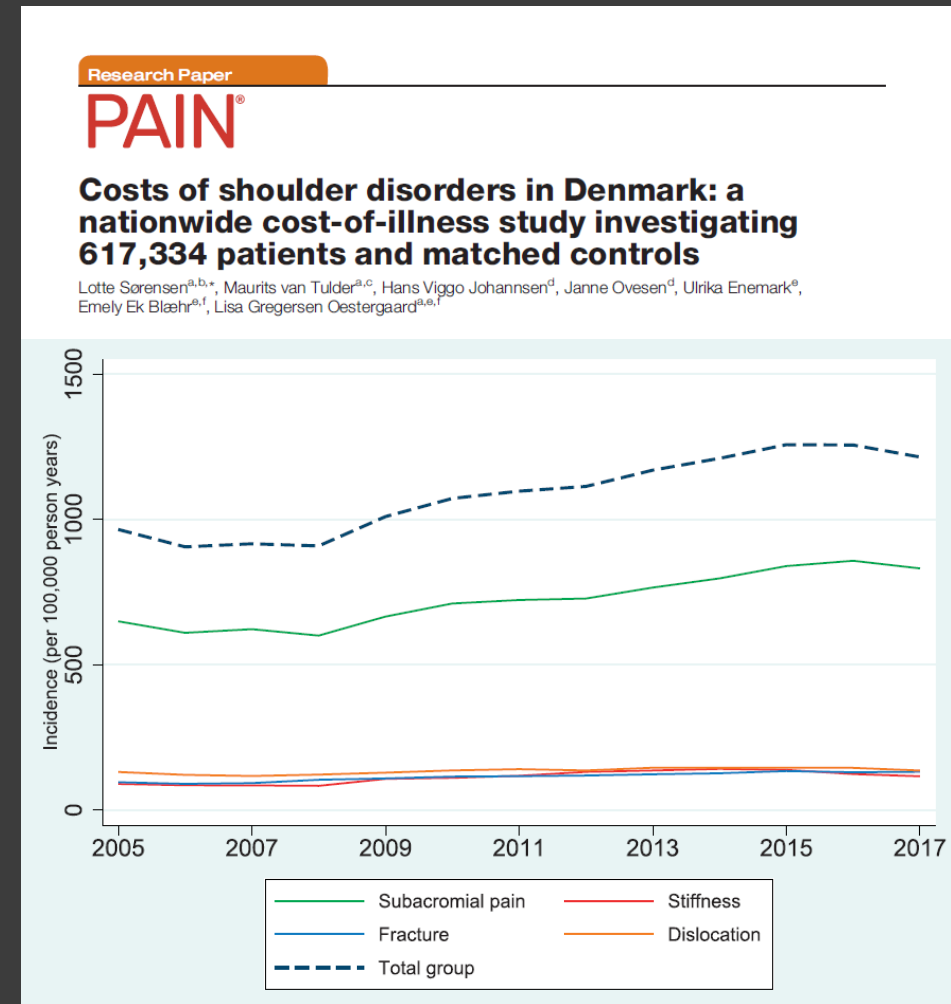
How many and who are they?

Characteristics

- More females
- Mean age ~50 y (60-70% from 35-65 y)

Numbers

- ~40 000 new cases in DK per year
(832 per 100 000 person-years)



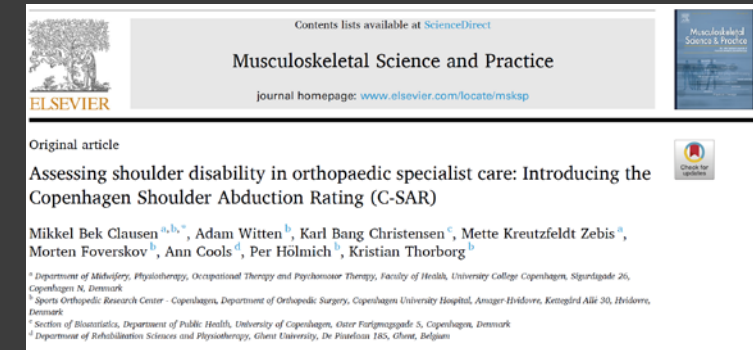
How many and who are they

Characteristics

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Numbers

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(832 per 1 00 000 person-years)



But why?

Work

- Heavy lifting, pushing, pulling, holding, carrying, working above shoulder height, repetitive work, vibration, working in awkward postures
- Combination of multiple physical shoulder loads at work (work above head, "forceful exertion")

Linaker & Walker-Bone 2015

High incidence of lost workdays in patients with subacromial impingement syndrome

Mikkel Bek Clausen^{1, 2}, Mathias Fabricius Nielsen², Mikas Bjørn Merrild¹, Per Hölmich^{2, 3} & Kristian Thorborg^{2, 3}

1) School of Physiotherapy, Department of Midwifery, Physiotherapy, Occupational Therapy and Psychomotor Therapy, Faculty of Health, University College Copenhagen, 2) Orthopedic Research Center – Copenhagen (SORC-C), Department of Orthopedic Surgery, Copenhagen University Hospital – Amager-Hvidovre Hospital, 3) Department of Clinical Medicine, University of Copenhagen, Denmark

Dan Med J 2021;68(6):A07200496

Table 3. Incidence of lost workdays for each job category

	Lost workdays (95%CI)	Number of patients (Surgery/no surgery)
Job category (from ISCO codes)		
Managers	23.5 (8.9 to 62.2) ^a	2 (2/0)
Professionals	15.0 (5.7 to 39.4) ^{a,b}	12 (3/9)
Technicians and Associate Professionals	2.3 (0.6 to 8.9) ^{a,b}	7 (1/6)
Clerical Support Workers	6.3 (1.7 to 23.5) ^{a,b}	9 (2/7)
Services and Sales Workers	48.9 (30.2 to 79.2)	18 (6/12)
Skilled Agricultural, Forestry and Fishery Workers		0 (0/0)
Craft and Related Trades Workers	1.2 (0.4 to 3.9) ^{a,b}	5 (0/5)
Plant and Machine Operators and Assemblers	19.4 (6.4 to 59.3) ^a	7 (2/5)
Elementary Occupations	76.5 (41.3 to 141.7)	6 (0/6)

^aSignificantly lower incidence rate when compared to Elementary Occupations (p<0.05)

^bSignificantly lower incidence rate when compared to Services and Sales Workers (p<0.05)

What are the consequences?

QoL (Mac

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Work (o

Sleep (Te

Severity

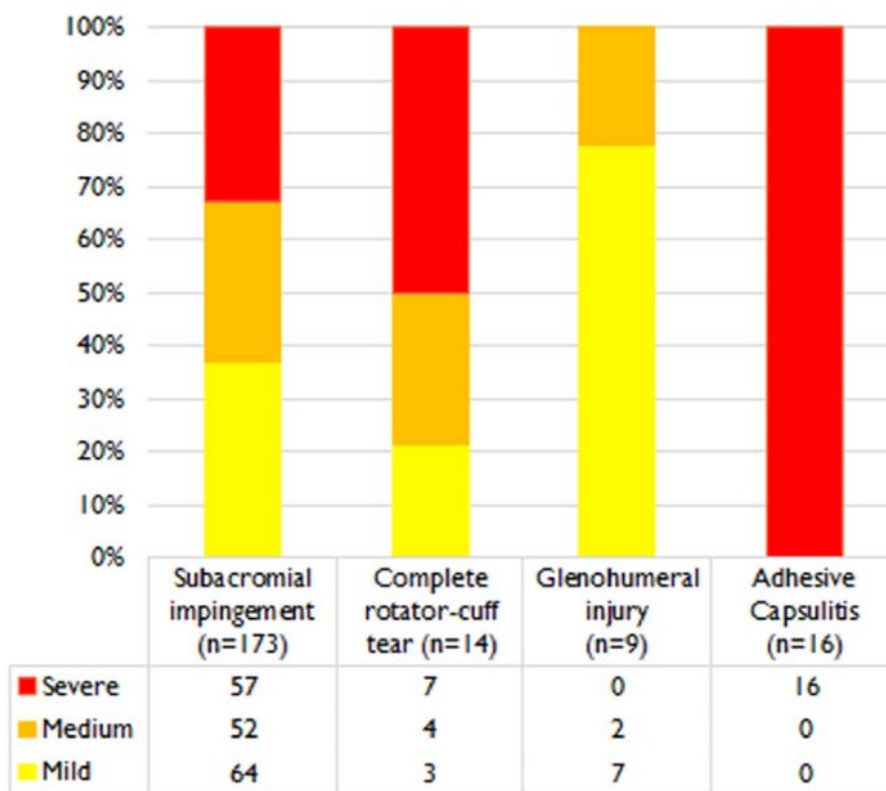


Fig. 5. Distribution of C-SAR levels within each of the four diagnostic categories.

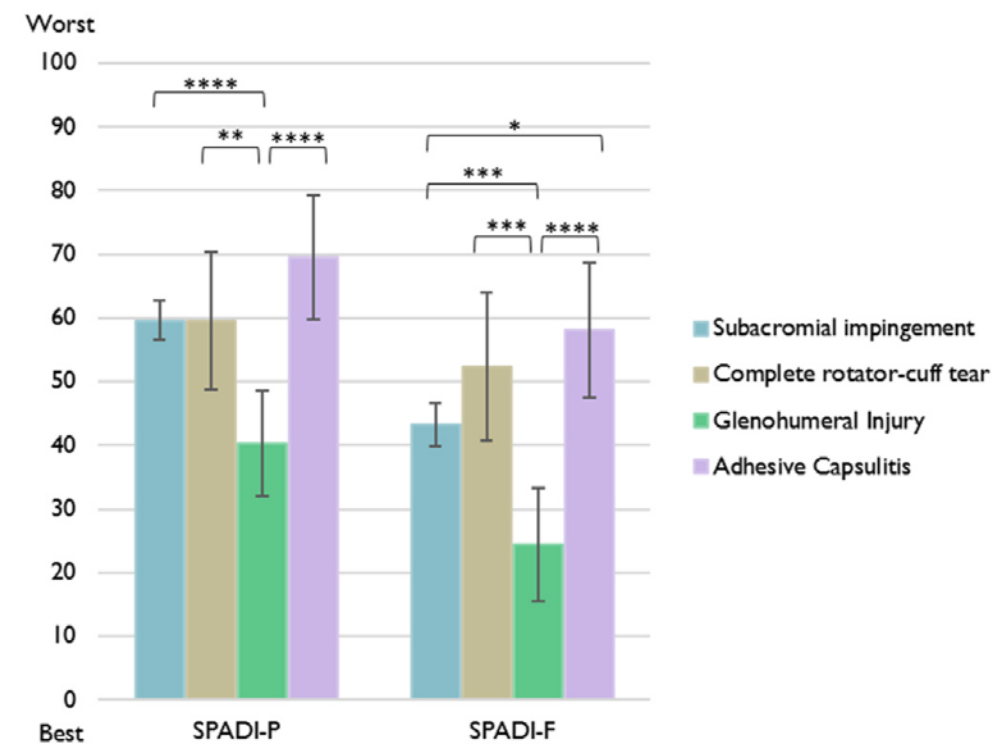


Fig. 4. Level of shoulder disability (SPADI-pain and SPADI-function) for each of the four diagnostic groups, including 95% confidence intervals. *p < .05, **p < .01, ***p < .001, ****p < .0001.

The Treatment

thebmj

RAPID RECOMMENDATIONS

Subacromial decompression surgery for adults with shoulder pain: a clinical practice guideline


“**Recommendation** The guideline panel makes
a strong recommendation against surgery.”

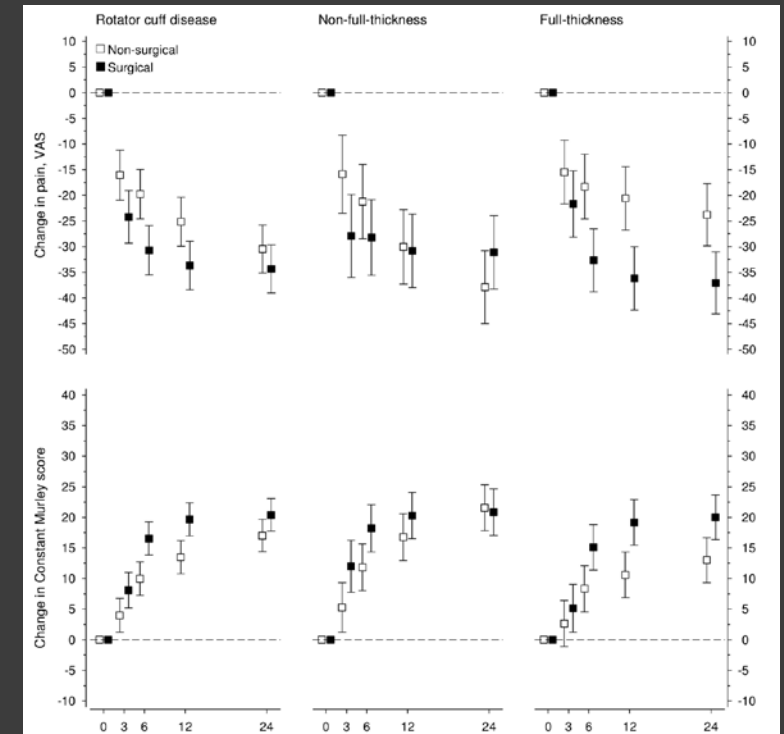
Treatment

Treatment

CLINICAL SCIENCE

Non-surgical and surgical treatments for rotator cuff disease: a pragmatic randomised clinical trial with 2-year follow-up after initial rehabilitation

Sanna Cederqvist ¹, Tapio Flinkkilä,² Markus Sormaala,³ Jari Ylinen,⁴ Hannu Kautiainen,^{5,6} Tero Irmola,¹ Heidi Lehtokangas,^{1,7} Juho Liukkonen,⁸ Konsta Pamilo,⁹ Tero Ridanpää,⁹ Kai Sirniö,² Juhana Leppilahti,² Ilkka Kiviranta,^{10,11} Juha Paloneva^{9,12}



CONCLUSIONS

Our results demonstrate that surgery does not provide superior results compared with non-surgical treatment for the majority of patients with RCD. Among patients with symptomatic RCD without a perforating tear, surgery did not provide benefit over non-surgical treatment, even when the initial non-surgical treatment did not provide sufficient pain relief. However, when the RCD included a perforating tear and symptoms continued after initial non-surgical treatment, rotator cuff repair surgery resulted in superior outcomes compared with non-surgical treatment.

RESEARCH

Open Access



The relationship between publication of high-quality evidence and changes in the volume and trend of subacromial decompression surgery for patients with subacromial pain syndrome in hospitals across Australia, Europe and the United States: a controlled interrupted time series analysis

Timon H. Geurkink^{1,2*}, Leti van Bodegom-Vos², Jochem Nagels¹, Susan Liew³, Pieter Stijnen⁴, Rob G.H.H. Nelissen¹ and Perla J. Marang-van de Mheen²

Abstract

Aims To evaluate the extent to which publication of high-quality randomised controlled trials(RCTs) in 2018 was associated with a change in volume or trend of subacromial decompression(SAD) surgery in patients with subacromial pain syndrome(SAPS) treated in hospitals across various countries.

Methods Routinely collected administrative data of the Global Health Data@work collaborative were used to identify SAPS patients who underwent SAD surgery in six hospitals from five countries (Australia, Belgium, Netherlands, United Kingdom, United States) between 01/2016 and 02/2020. Following a controlled interrupted time series design, segmented Poisson regression was used to compare trends in monthly SAD surgeries before(01/2016-01/2018) and after(02/2018-02/2020) publication of the RCTs. The control group consisted of musculoskeletal patients undergoing other procedures.

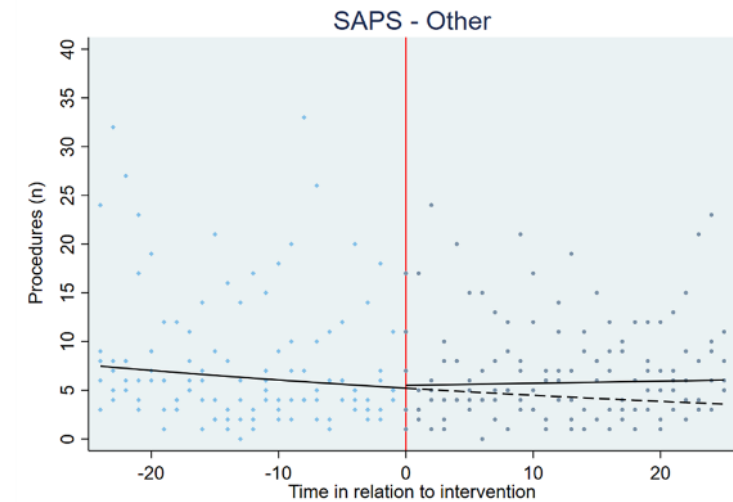
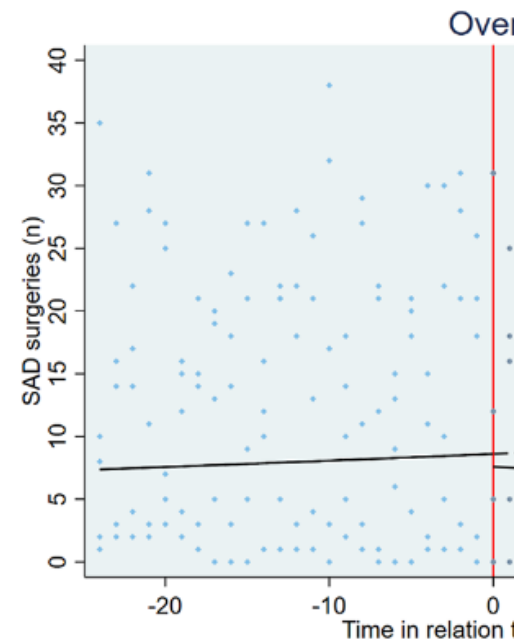
Results A total of 3.046 SAD surgeries were performed among SAPS patients treated in five hospitals; one hospital did not perform any SAD surgeries. Overall, publication of trial results was associated with a significant reduction in the trend to use SAD surgery of 2% per month (Incidence rate ratio (IRR) 0.984[0.971–0.998]; $P=0.021$), but with large variation between hospitals. No changes in the control group were observed. However, publication of trial results was also associated with a 2% monthly increased trend (IRR 1.019[1.004–1.034]; $P=0.014$) towards other procedures performed in SAPS patients.

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Full list of author information is available at the end of the article



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	IRR (95%CI)	P-value
Trend pre intervention (β_1)	0.985 (0.982-0.989)	<0.001
Level change (β_2)	1.037 (0.938-1.147)	0.474
Trend change (β_3)	1.019 (1.004-1.034)	0.014
Constant (β_0)	5.3 (2.9-9.6)	<0.001

	IRR (95%CI)	P-value
Trend pre intervention (β_1)	1.006 (0.996-1.017)	0.221
Level change (β_2)	0.943 (0.824-1.079)	0.393
Trend change (β_3)	0.984 (0.971-0.998)	0.021
Constant (β_0)	8.046 (2.3-28.3)	0.001

What about exercise then?

RESEARCH

Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study

OPEN ACCESS

Theresa Holmgren PhD student¹, Hanna Björnsdóttir Hallgrím PhD student², Brigitta Öberg professor³, Lars Adolphson professor⁴, Kajsa Johansson senior lecturer⁵

¹Department of Medical and Health Sciences, Division of Physiotherapy, Linköping University, SE-581 83, Linköping, Sweden; ²Department of Orthopaedics, University Hospital, GC 501, Linköping

Abstract Objective To evaluate if a specific exercise strategy, targeting the rotator cuff and scapular stabilisers, improves shoulder function and pain more than nonspecific exercises in patients with subacromial impingement syndrome. Primary outcome is the need for orthopaedic subacromial decompression.

Design Randomised, participant and single assessor blinded, controlled study.

Setting Department of orthopaedics in a Swedish university hospital.

Participants 102 patients with long standing (over six months) persistent subacromial impingement syndrome in whom earlier conservative treatment had failed, recruited through orthopaedic specialists.

Interventions The specific exercise strategy consisted of strengthening exercises, exercises for the rotator cuff and scapulothoracic movement for the rotator cuff, and rotator cuff and scapulothoracic movement for the scapular stabilisers in combination with manual mobilisation. The control exercise programme consisted of strengthening exercises for the rotator cuff and scapulothoracic movement for the rotator cuff, and rotator cuff and scapulothoracic movement for the scapular stabilisers in combination with manual mobilisation.

Main outcome measures The primary outcome was the Constant-Murley shoulder assessment score evaluating shoulder function and pain. Secondary outcomes were subjective global impression of change because of treatment and decision regarding surgery.

Results Most (87%) participants completed the 12 week study. There was a significantly greater improvement in the Constant-Murley score in the specific exercise group than in the control exercise group (24 points (95% confidence interval 19 to 29) v 8 points (95% CI 5 to 13), mean difference between groups 16 points (95% CI 10 to 22). Significantly more patients in the specific exercise group required additional surgery (defined as larger improvement or necessary) in the patients' global

assessment of change because of treatment (49% (95% CI 42% to 56%) odds ratio 7.0, 95% CI 1.6 to 318, P<0.001). A significantly lower proportion of patients in the specific exercise group subsequently chose to undergo surgery (20% (95% CI 14% to 28%) odds ratio 2.1, 95% CI 1.0 to 4.0, P=0.03).

Conclusion A specific exercise strategy, focusing on strengthening specific exercises for the rotator cuff and scapulothoracic movement for the scapular stabilisers, is effective in reducing pain and improving shoulder function in patients with persistent subacromial impingement syndrome. In addition, the exercise strategy reduces the need for orthopaedic subacromial decompression within the three month duration used in the study.

Trial registration Clinical Trials NCT03202873

Introduction

Subacromial impingement syndrome is said to have multiple causes.¹ Several structures, such as the subacromial bursa, the tendons of the rotator cuff, the acromion, the coracoacromial ligament, and the coracoclavicular ligament of the longus biceps muscle, are involved in the pathogenesis of subacromial impingement syndrome (fig 1).² Multiple factors have been proposed as contributing to the development of subacromial impingement syndrome, including altered shoulder kinematics associated with dysfunction of the rotator cuff and scapular muscles,^{3,4} scapular dyskinesis,^{5,6} poor posture,^{7,8} and overuse secondary to sustained intensive work.^{9,10}

Conservative treatment is the first choice, often with corticosteroid injections or different physiotherapy interventions, as both.¹¹ Some studies have reported specific exercise treatment to be effective,^{12,13} but the substantial evidence for its effectiveness is uncertain because of the limited number of studies and several with methodological concerns.^{14–16} Therefore

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Progressive exercise compared with best practice advice, with or without corticosteroid injection, for the treatment of patients with rotator cuff disorders (GRASP): a multicentre, pragmatic, 2 x 2 factorial, randomised controlled trial

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Background Corticosteroid injections and physiotherapy exercise programmes are commonly used to treat rotator cuff disorders but the treatment effectiveness is uncertain. We aimed to compare the clinical effectiveness and cost-effectiveness of a progressive exercise programme with a single course of best practice physiotherapy advice, with or without corticosteroid injection, in adults with a rotator cuff disorder.

Methods In this pragmatic, multicentre, superiority, randomised controlled trial (2 x 2 factorial), we recruited patients from 20 UK National Health Service trusts. We included patients aged 18 years or older with a rotator cuff disorder (low episode within the past 6 months). Patients were excluded if they had a history of significant shoulder trauma (eg, abduction, fracture, or fall/direct blow requiring surgery), neurological disease affecting the shoulder, other shoulder conditions (eg, inflammatory arthritis, frozen shoulder, or glenohumeral joint instability), received corticosteroid injection or physiotherapy for shoulder pain in the past 6 months, or were being considered for surgery. Patients were randomly assigned (parallel computer generated system, 1:1) to progressive exercise (six sessions), best practice advice (one session), corticosteroid injection then progressive exercise, or corticosteroid injection then best practice advice. The primary outcome was the Shoulder Pain and Disability Index (SPADI) score over 12 months, analysed on an intention-to-treat basis (statistical significance at $\alpha=0.05$). The trial was registered with the International Standard Randomised Controlled Trial Register, ISRCTN16359396, and EudraCT, 2016-002995-18.

Findings Between March 16, 2017, and May 2, 2019, we screened 2387 patients. 768 patients were randomly assigned to progressive exercise (n=374), best practice advice (n=74), corticosteroid injection then progressive exercise (n=32), or corticosteroid injection then best practice advice (n=78). Over 12 months, SPADI data were available for 634 (90%) patients in the progressive exercise group, 164 (90%) in the best practice advice group, 177 (97%) in the corticosteroid injection then progressive exercise group, and 175 (98%) in the corticosteroid injection then best practice advice group. We found no evidence of a difference in SPADI score between progressive exercise and best practice advice when analysed over 12 months (adjusted mean difference -0.6 (95% CI -1.2 to 0.0). We also found no evidence of a difference between corticosteroid injection compared with an injection when analysed over 12 months (-1.1 (-1.4 to -0.7) to 2.16). No serious adverse events were reported.

Interpretation Progressive exercise was not superior to a best practice advice session with a physiotherapist in improving shoulder pain and function. Subacromial corticosteroid injection proved to be long-term benefit to patients with rotator cuff disorders.

Funding UK National Institute for Health Research (NIHR) Research Assessment Programme.

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Introduction Rotator cuff disorders are common, with approximately 1% of adults aged 45 years and older presenting to primary care services with a new episode of shoulder pain each year, accounting for 2.4% of all general practitioner (GP) consultations in the UK.¹ Disorders of the rotator cuff are the most common cause, accounting for 70% of cases. Rotator cuff disorders are often associated with subacromial

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Does the addition of motor control or strengthening exercises to education result in better outcomes for rotator cuff-related shoulder pain? A multiarm randomised controlled trial

Marc-Olivier Dubé^{1,2}, François Desmeules^{3,4}, Jeremy S Lewis^{5,6}, Jean-Sébastien Roy^{1,2}

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Objective To compare the short-term, mid-term and long-term effects between three interventions (education only, education and strengthening exercises, education and motor control exercises) for rotator cuff-related shoulder pain (RCRSP) on symptoms, performance, altered shoulder kinematics, and maladaptive pain behaviours like kinesiophobia and catastrophisation.

Methods 123 adults presenting with RCRSP took part in a 12-week intervention. They were randomly assigned to 1 of 3 intervention groups. Symptoms and function were evaluated at baseline and at 3 weeks, 6 weeks, 12 weeks and 24 weeks using the Disability of Arm, Shoulder and Hand Questionnaire (DASH) (primary outcome) and Western Ontario Macristic Cervical Neck Pain (WOMAC) Neck Pain subscale (secondary outcome). Linear mixed modelling was used to compare the effects of the three programmes on the outcomes.

Results After 24 weeks, between-group differences were 2.1 (7.7 to -3.5) (motor control vs education), 1.2 (4.9 to -3.6) (strengthening vs education) and -3.3 (8.5 to 1.9) (motor control vs strengthening) for the DASH and 0.3 (1.7 to 1.1) (motor control vs education), 1.3 (-7.8 to 6.2) (strengthening vs education) and 0.2 (-0.5 to 0.9) (motor control vs strengthening) for the WOMAC. There was a significant group-by-time interaction (p=0.04) with DASH, but follow-up analysis did not reveal any clinically meaningful between-group differences. There was no significant group-by-time interaction (p=0.30) for the WOMAC. Between-group differences were reported the natural clinicaly important difference of QuADRAS at 12 weeks.

Conclusion In people with RCRSP, the addition of motor control or strengthening exercises to education did not lead to larger improvements in symptoms and function compared with education alone. Further research should investigate the value of providing targeted care by identifying individuals who may only need education and those who would benefit from the addition of motor control or strengthening exercises.

How this study might affect research, practice or policy Clinicians could consider using education as a stand-alone intervention for the management of patients with RCRSP as the addition of exercises to education did not improve outcomes.

Registration number NCT03265053

Introduction Rotator cuff-related shoulder pain (RCRSP) accounts for approximately 70% of shoulder pain consultations. The associated pain, reduced function, decreased muscle performance, altered shoulder kinematics, and maladaptive pain behaviours such as kinesiophobia and catastrophisation,^{1,2}

Management approaches involve education, exercise,^{3,4} corticosteroid injections, and surgery.^{5,6} However, 80% of individuals do not report significant improvement.^{7,8}

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REVIEW ARTICLE

The Efficacy of Higher Versus Lower Dose Exercise in Rotator Cuff Tendinopathy: A Systematic Review of Randomized Controlled Trials

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Objective To compare the effectiveness and harms of higher exercise dose, including higher exercise load or higher volume, with lower exercise dose (lower load or lower volume) in individuals with rotator cuff tendinopathy.

Design Systematic review.

Data Sources Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, and CINAHL, from inception to March 2019.

Study Selection Randomised controlled trials comparing higher versus lower exercise dose, including those that investigated function and pain (overall, activity, night) and adverse event outcomes were independently determined by 2 reviewers.

Data Extraction Two authors independently extracted data and assessed risk of bias using the Cochrane tool. The primary outcome was at least 6 weeks to 3 months (either endpoint included up to 6 weeks and beyond 3 months) and the Oakes of Recommendation, Assessment, Development and Evaluation was used to assess evidence certainty.

Data Synthesis This trial (N=281), not at low risk of bias for all domains, was included. Low-certainty evidence (1 trial, N=107) indicated improved function (20 points (95% confidence interval 11 to 29) on a 0-100 point scale) with higher load and volume exercise at 3 months, but this was not clinically important between-group differences in activity or night pain (overall pain not reported). Very low-certainty evidence (1 trial, N=126) indicated higher load exercise conferred an effect on function benefits over lower load exercise at 6 weeks. Very low-certainty evidence (1 trial, N=61) indicated benefits of low-intensity exercise to function with higher versus lower volume exercise at 12 weeks and clinically important benefits at more than 3 months from volume not reported. The risk of adverse events was unclear.

Conclusions There are few studies that have evaluated higher exercise dose exercise for rotator cuff tendinopathy. There was low to very low certainty and conflicting evidence regarding the value of higher exercise dose in individuals with rotator cuff tendinopathy.

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What about exercise then?

Exercise categories	Included in intervention	
	Best Practice Advice	Progressive Exercise
Pectoralis major and anterior capsule stretch		
Posterior shoulder/capsule stretch		✓
Other shoulder stretches		

BMJ

BMJ 2012;344:e707 doi: 10.1136/bmj.e707 Published 20 February 2012 Page 1 of 8

RESEARCH

Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study

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Abstract Objectives To evaluate if a specific exercise strategy, targeting the rotator cuff and acromioclavicular, improves shoulder function and pain more than nonspecific exercises in patients with subacromial impingement syndrome, thereby decreasing the need for subsequent surgical decompression.

Design Randomised, participant and single assessor blinded, controlled study.

Setting Department of orthopaedics in a Swedish university hospital.

Participants 122 patients with long standing (over six months) persistent subacromial impingement syndrome in whom earlier conservative treatment had failed, recruited through orthopaedic specialists.

Interventions The specific exercise strategy consisted of strengthening exercises for the rotator cuff and acromioclavicular joint, and the nonspecific exercise programme consisted of nonspecific movement exercises for the neck and shoulder. Patients in both groups received free to eat individual patient treatment sessions during 12 weeks, in addition three individualised sessions for participants performing home exercises once or twice a day for 12 weeks.

Main outcome measures The primary outcome was the Constant-Mulvey shoulder assessment score evaluating shoulder function and pain. Secondary outcomes were patients' global perception of change because of treatment and decision regarding surgery.

Results Most (97%) participants completed the 12 week study. There was a significantly greater improvement in the Constant-Mulvey score in the specific exercise group than in the control exercise group (24 points (95% confidence interval 19 to 29) v 8 points (95% to 13), mean difference between groups 16 points (95% CI 10 to 22). Significantly more patients in the specific exercise group reported successful outcomes (defined as large improvement or recovery) in the patients' global

Articles

Progressive exercise compared with best practice advice, with or without corticosteroid injection, for the treatment of patients with rotator cuff disorders (GRASP): a multicentre, pragmatic, 2 x 2 factorial, randomised controlled trial

Sally Hopwood, David Evans, Emma Williams, Melissa Doherty, Peter Hines, Lucy Cantello, Susan Dutton, Helen Doherty, Andrew Carr, William Hamilton, Zoran Hranjec, Anja Jagg, Chen Lichang, Karen L Baker, Alexander Gray, Sarah J Lamb, on behalf of the GRASP Study Group

Summary Background Corticosteroid injections and physiotherapy exercise programmes are commonly used to treat rotator cuff disorders but the treatment effectiveness is uncertain. We aimed to compare the clinical effectiveness and cost-effectiveness of a progressive exercise programme with a single session of best practice physiotherapy advice, with or without corticosteroid injection, in adults with a rotator cuff disorder.

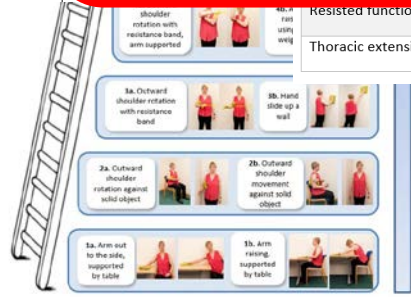
Method In this pragmatic, multicentre, superiority, randomised controlled trial (2 x 2 factorial), we recruited patients from 20 UK National Health Service trusts. We included patients aged 18 years or older with a rotator cuff disorder (one episode within the past 6 months). Patients were excluded if they had a history of significant shoulder trauma (eg, dislocation, fracture, or full-thickness tear requiring surgery), neurological disease affecting the shoulder, other shoulder conditions (eg, inflammatory arthritis, frozen shoulder, or glenohumeral joint instability), received corticosteroid injection or physiotherapy for shoulder pain in the past 6 months, or were being considered for surgery. Patients were randomly assigned (computer generated system, 1:1:1:1) to progressive exercise (six sessions), best practice advice (one session), corticosteroid injection then progressive exercise, or corticosteroid injection then best practice advice. The primary outcome was the Shoulder Pain and Disability Index (SPADI) score over 12 months, analysed on an intention-to-treat basis (statistical significance set at P<0.05). The trial was registered with the International Standard Randomised Controlled Trial Register, ISRCTN16399304, and EudraCT, 2016-00299-25.

Findings Between March 16, 2017, and May 2, 2019, we screened 2287 patients. 768 patients were randomly assigned to progressive exercise (n=174), best practice advice (n=174), corticosteroid injection then progressive exercise (n=122), or corticosteroid injection then best practice advice (n=178). Over 12 months, SPADI data were available for 566 (97%) patients in the progressive exercise group, 564 (97%) in the best practice advice group, 177 (97%) in the corticosteroid injection then progressive exercise group, and 175 (98%) in the corticosteroid injection then best practice advice group. We found no evidence of a difference in SPADI score between progressive exercise and best practice advice when analysed over 12 months (adjusted mean difference -0.6 (95% CI -4.52 to 3.26)). We also found no evidence of a difference between corticosteroid injection compared with an injection when analysed over 12 months (-1.11 (-4.47 to 2.26)). No serious adverse events were reported.

Interpretation Progressive exercise was not superior to a best practice advice session with a physiotherapist in improving shoulder pain and function. Subacromial corticosteroid injection provided no long-term benefit in patients with rotator cuff disorders.

Funding UK National Institute for Health Research Technology Assessment Programme.
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	Best Practice Advice		Progressive Exercise		No Injection		Injection		Overall	
	n	%	n	%	n	%	n	%	n	%
8 weeks										
Every day	34	9.7%	40	11.2%	34	9.8%	40	11.1%	74	10.5%
6 days per week	15	4.3%	15	4.2%	15	4.3%	15	4.2%	30	4.2%
5 days per week	152	43.2%	215	60.4%	160	46.0%	207	57.5%	367	51.8%
4 days per week	26	7.4%	19	5.3%	27	7.8%	18	5.0%	45	6.4%
3 days per week	15	4.3%	6	1.7%	15	4.3%	6	1.7%	21	3.0%
2 days per week	9	2.6%	2	0.6%	6	1.7%	5	1.4%	11	1.6%
1 day per week	3	0.9%	0	0.0%	1	0.3%	2	0.6%	3	0.4%
None	28	8.0%	11	3.1%	18	5.2%	21	5.8%	39	5.5%
Missing	70	19.9%	48	13.5%	72	20.7%	46	12.8%	118	16.7%
6 months										
Every day	19	5.4%	14	3.9%	14	4.0%	19	5.3%	33	4.7%
6 days per week	5	1.4%	4	1.1%	7	2.0%	2	0.6%	9	1.3%
5 days per week	53	15.1%	66	18.5%	42	12.1%	77	21.4%	119	16.8%
4 days per week	24	6.8%	26	7.3%	22	6.3%	28	7.8%	50	7.1%
3 days per week	33	9.4%	33	9.3%	34	9.8%	32	8.9%	66	9.3%
2 days per week	27	7.7%	19	5.3%	20	5.7%	26	7.2%	46	6.5%
1 day per week	13	3.7%	11	3.1%	13	3.7%	11	3.1%	24	3.4%
None	101	28.7%	117	32.9%	116	33.3%	102	28.3%	218	30.8%
Missing	76	21.6%	65	18.3%	79	22.7%	62	17.2%	141	19.9%



Shoulder rotation with resistance band, arm supported	✓
Thoracic extension	

■ SPECIFIC BETTER THAN NON-SPECIFIC

■ SUPERVISED PROGRESSIVE EXERCISE NOT BETTER THAN ADVISE (ALSO ABOUT EXERCISE)

What about exercise then?

RESEARCH

Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study

Theresa Holmgren PhD student¹, Hanna Björnsson Hallgrén PhD student², Birgitta Öberg professor³, Lars Adolphson professor⁴, Kajsa Johansson senior lecturer⁵

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Abstract
Objective To evaluate if a specific exercise strategy, targeting the rotator cuff and scapular stabilisers, improves shoulder function and pain more than nonspecific exercises in patients with subacromial impingement syndrome, thereby decreasing the need for subsequent subacromial decompression.
Design Randomised, participant and single assessor blinded, controlled study.
Setting Department of orthopaedics in a Swedish university hospital.
Participants 122 patients with long standing pain due to rotator cuff and subacromial impingement syndrome in whom earlier conservative treatment had failed, recruited through orthopaedic specialists.
Interventions The specific exercise strategy consisted of strengthening exercises for the rotator cuff and scapular stabilisers, and stretching exercises for the rotator cuff and subacromial impingement syndrome. The nonspecific exercise strategy consisted of strengthening exercises for the rotator cuff and scapular stabilisers, and stretching exercises for the rotator cuff and subacromial impingement syndrome. The exercise strategy reduced the need for subsequent subacromial decompression within the three month duration used in the study.
Main outcomes measures The primary outcome was the Constant-Murley shoulder assessment score evaluating shoulder function and pain. Secondary outcomes were subjective global perception of change because of treatment and decision regarding surgery.

Introduction
 Subacromial impingement syndrome is said to have multiple causes.¹ Several structures, such as the subacromial bursa, the tendons of the rotator cuff, the acromion, the coracoacromial ligament, and the coracoclavicular ligament of the long head of the biceps brachii muscle, are involved in the pathogenesis of subacromial impingement syndrome (fig 1). Multiple factors have been proposed as contributing to the development of subacromial impingement syndrome, including altered shoulder kinematics associated with dysfunction of the rotator cuff and scapular muscles,²⁻⁴ scapular dyskinesis,⁵ poor posture,^{6,7} and excessive secondary to sustained intensive work.^{8,9}

Conservative treatment is the first choice, often with corticosteroid injections or different physiotherapy interventions, as both.¹⁰ Some studies have reported specific exercise treatment to be effective,¹¹⁻¹³ but the substantial evidence for its effectiveness is uncertain because of the limited number of studies and several with methodological concerns.¹⁴⁻¹⁶ Therefore

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Progressive exercise compared with best practice advice, with or without corticosteroid injection, for the treatment of patients with rotator cuff disorders (GRASP): a multicentre, pragmatic, 2 x 2 factorial, randomised controlled trial

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Background Corticosteroid injections and physiotherapy exercise programmes are commonly used to treat rotator cuff disorders but the treatment effectiveness is uncertain. We aimed to compare the clinical effectiveness and cost-effectiveness of a progressive exercise programme with a single session of best practice physiotherapy advice, with or without corticosteroid injection, in adults with a rotator cuff disorder.

Methods In this pragmatic, multicentre, superiority, randomised controlled trial (2 x 2 factorial), we recruited patients from 20 UK National Health Service trusts. We included patients aged 18 years or older with a rotator cuff disorder (low episode within the past 6 months). Patients were excluded if they had a history of significant shoulder trauma (eg, abduction fracture, or full-thickness tear requiring surgery), neurological disease affecting the shoulder, other shoulder conditions (eg, inflammatory arthritis, frozen shoulder, or glenohumeral joint instability), received corticosteroid injection or physiotherapy for shoulder pain in the past 6 months, or were being considered for surgery. Patients were randomly assigned (computer generated system, 1:1:1:1) to progressive exercise (six sessions), best practice advice (one session), corticosteroid injection (one progressive exercise, or corticosteroid injection then best practice advice). The primary outcome was the Shoulder Pain and Disability Index (SPADI) score over 12 months, analysed on an intention-to-treat basis (statistical significance at α 0.05). The trial was registered with the International Standard Randomised Controlled Trial Register, ISRCTN16359396, and EudraCT, 2016-002995-18.

Findings Between March 16, 2017, and May 2, 2018, we screened 2287 patients. 768 patients were randomly assigned to progressive exercise (n=174), best practice advice (n=78), corticosteroid injection then progressive exercise (n=122), or corticosteroid injection then best practice advice (n=78). Over 12 months, SPADI data were available for 648 (97%) patients in the progressive exercise group, 64 (9%) in the corticosteroid injection then progressive exercise group, and 175 (98%) in the corticosteroid injection then best practice advice group. We found no evidence of a difference in SPADI score between progressive exercise and best practice advice when analysed over 12 months (adjusted mean difference -0.6 (95% CI -1.2 to 0.0). We also found no evidence of a difference between corticosteroid injection compared with no injection when analysed over 12 months (-1.1 (-1.4 to -0.7) to 0.2). No serious adverse events were reported.

Interpretation Progressive exercise was not superior to a best practice advice session with a physiotherapist in improving shoulder pain and function. Subacromial corticosteroid injection provided no long-term benefit in patients with rotator cuff disorders.

Introduction
 Shoulder pain is common, with approximately 1% of adults aged 45 years and older presenting to primary care services with a new episode of shoulder pain each year, accounting for 2.4% of all general practitioner (GP) consultations in the UK.¹ Disorders of the rotator cuff are the most common cause, accounting for 70% of cases. Rotator cuff disorders are often associated with substantial

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Does the addition of motor control or strengthening exercises to education result in better outcomes for rotator cuff-related shoulder pain? A multiarm randomised controlled trial

Marc-Olivier Dubé^{1,2}, François Desmeules^{3,4}, Jeremy S Lewis^{5,6}, Jean-Sébastien Roy^{1,2}

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Objective To compare the short-term, mid-term and long-term effects between three interventions (education only, education and strengthening exercises, education and motor control exercises) for rotator cuff-related shoulder pain (RCRSP) on performance, function, pain, and patient satisfaction.

Methods 123 adults presenting with RCRSP took part in a 12-week intervention. They were randomly assigned to 1 of 3 intervention groups. Symptoms and function were evaluated at baseline and at 3 weeks, 6 weeks, 12 weeks and 24 weeks using the Disability of Arm, Shoulder and Hand Questionnaire (DASH) (primary outcome) and Western Ontario Maculistat Cuff Index (WOMAC). Linear mixed modelling was used to compare the effects of the three programmes on the outcomes.

Results After 24 weeks, between-group differences were 2.1 (7 to 2.0) (motor control vs education), 1.1 (4.9 to 3.7) (education vs education and strengthening), 1.2 (8.8 to 7.4) (education vs education and motor control), and 1.3 (2.8 to 1.2) (motor control vs education and motor control) (all p < 0.05). There was no significant group-by-time interaction (p > 0.05) with respect to outcomes. The results suggest that education alone or education combined with motor control exercises may be sufficient to improve outcomes in individuals with RCRSP. The addition of motor control or strengthening exercises did not lead to larger improvements in symptoms and function compared with education alone. Further research should investigate the value of providing targeted care by identifying individuals who may only need education and those who would benefit from the addition of motor control or strengthening exercises.

Conclusion In people with RCRSP, the addition of motor control or strengthening exercises to education did not lead to larger improvements in symptoms and function compared with education alone. Further research should investigate the value of providing targeted care by identifying individuals who may only need education and those who would benefit from the addition of motor control or strengthening exercises.

Introduction
 Rotator cuff-related shoulder pain (RCRSP) accounts for approximately 70% of shoulder pain consultations. The associated role of reduced function, decreased motor performance, altered shoulder biomechanics, and inadequate pain management makes it a complex condition.¹⁻³ Management commonly involves education, exercise,⁴ medication, injections, and surgery.⁵ However, 40% of individuals do not report significant improvement.^{6,7}

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The Efficacy of Higher Versus Lower Dose Exercise in Rotator Cuff Tendinopathy: A Systematic Review of Randomized Controlled Trials

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Objective To compare the effectiveness and harms of higher exercise dose, including higher exercise load or higher volume, with lower exercise dose (lower load or lower volume) in individuals with rotator cuff tendinopathy.
Design Systematic review.
Data Sources Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, and CINAHL, from inception to March 2019.
Study Selection Randomized controlled trials comparing higher versus lower dose exercise that investigated function and pain (visual, activity, night) and adverse event outcomes were independently determined by 2 reviewers.
Data Extraction Two authors independently extracted data and assessed risk of bias using the Cochrane tool. The primary outcome was at least 6 weeks to 3 months (either endpoint included up to 6 weeks and beyond 3 months) and the Cochrane of Recommendation, Assessment, Development and Evaluation was used to assess evidence certainty.
Data Synthesis This trial (N=281), now at low risk of bias for all domains, was included. Low-certainty evidence (1 trial, N=107) indicated improved function (DII points (95% confidence interval) 1.24 (0 to 0.100 point) walk) with higher load and volume exercise at 3 months, but this was not clinically important between-group difference in activity or night pain (overall pain not reported). Very low-certainty evidence (1 trial, N=126) indicated higher load exercise conferred no function benefits over lower load exercise at 6 weeks. Very low-certainty evidence (1 trial, N=61) indicated benefits of low-intensity exercise to function with higher versus lower volume exercise at 12 weeks and clinically important benefits at more than 3 months from volume not reported. The risk of adverse events was uncertain.
Conclusions There are few studies that have evaluated higher dose exercise for rotator cuff tendinopathy. There was low to very low certainty and conflicting evidence regarding the value of higher exercise dose in individuals with rotator cuff tendinopathy.
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Shoulder pain is estimated to have a prevalence between 15% and 30% in the general population, with prevalence increasing with age. Rotator cuff tendinopathy is the most common cause, accounting for up to 80% of all cases of shoulder pain in primary care. Although often self-limiting, up to 30% of patients who present to their GP may continue to experience ongoing pain and disability beyond 12 weeks. This results in significant morbidity and health resource utilization, given that shoulder function is essential to personal hygiene, dressing, and work.¹

Management commonly involves education, exercise,⁴ medication, injections, and surgery.⁵ However, 40% of individuals do not report significant improvement.^{6,7}

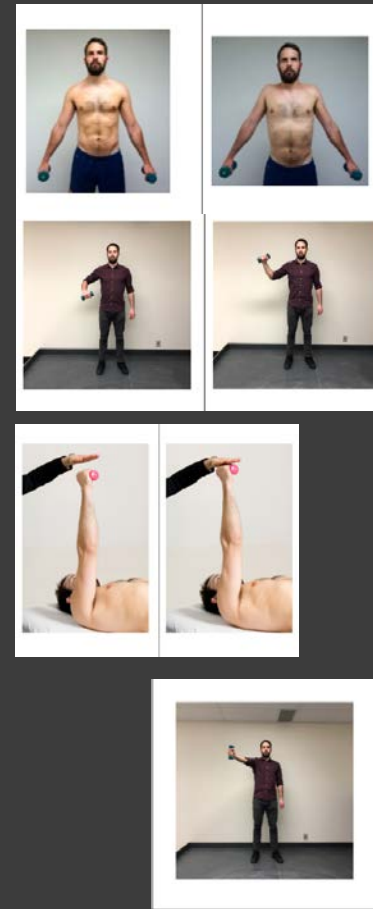
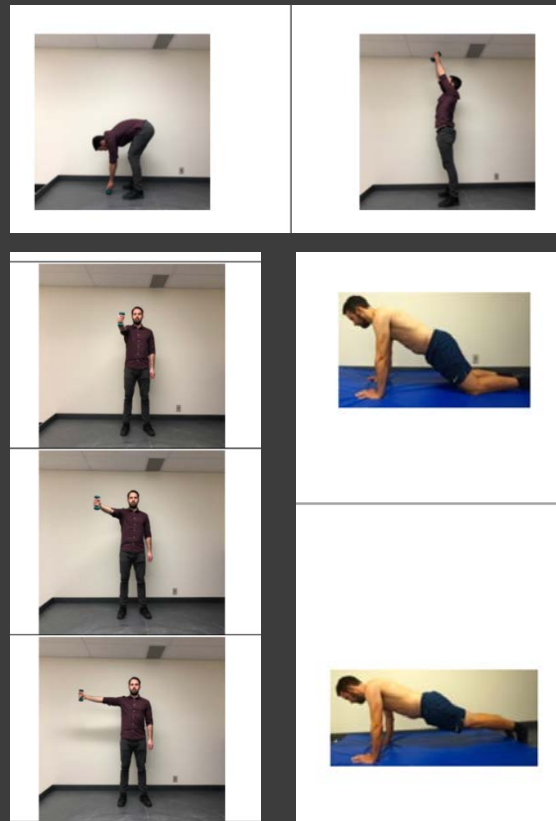
Correspondence to: P Malliaras, peter.malliaras@monash.edu
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▪ SPECIFIC BETTER THAN NON-SPECIFIC

▪ SUPERVISED PROGRESSIVE EXERCISE NOT BETTER THAN ADVISE (ALSO ABOUT EXERCISE)

▪ NO TYPE OF EXERCISE FOUND SUPERIOR (AND NOT EVEN TO ADVISE ALONE)

What about exercise then?



■ NO TYPE OF EXERCISE FOUND SUPERIOR (AND NOT EVEN TO ADVISE ALONE)

Original research

Does the addition of motor control or strengthening exercises to education result in better outcomes for rotator cuff-related shoulder pain? A multiarm randomised controlled trial

Marc-Olivier Dubé^{1,2}, François Desmeules^{1,2}, Jeremy S Lewis³, Jean-Sébastien Roy^{1,2}

ABSTRACT
Objective: To compare the short-term, mid-term and long-term effects between three interventions (education only, education and strengthening exercises, education and motor control exercises) for rotator cuff-related shoulder pain (RCRSP) on symptoms and function.
Methods: 123 adults presenting with RCRSP took part in a 12-week intervention. They were randomly assigned to 1 of 3 intervention groups. Symptoms and function were evaluated at baseline and at 3 weeks, 6 weeks, 12 weeks and 24 weeks using the Disability of Arm, Shoulder and Hand Questionnaire (DASH) (primary outcome) and Western Ontario Maculist-Cuff Index (WORC). Linear mixed modelling was used to compare the effects of the three programmes on the outcomes.
Results: After 24 weeks, between-group differences were +1.1 (7 to 2.3) (motor control vs education), -1.1 (-4.3 to 7.4) (strengthening vs education) and -3.3 (-9.5 to 2.8) (motor control vs strengthening) for the DASH and 3.3 (-1.5 to 17.7) (motor control vs education), 3.3 (-7.8 to 16.2) (strengthening vs education) and 6.5 (-0.5 to 16.3) (motor control vs strengthening) for the WORC. There was a significant group-by-time interaction ($p=0.04$) with DASH, but follow-up analysis did not reveal any clinically meaningful between-group differences. There was no significant group-by-time interaction ($p=0.39$) for the WORC. Between-group differences never exceeded the minimal clinically important difference of QuaiDASH or WORC.
Conclusion: In people with RCRSP, the addition of motor control or strengthening exercises to education did not lead to larger improvements in symptoms and function compared with education alone. Further research should investigate the value of providing tailored care by identifying individuals who may only need education and those who would benefit from the addition of motor control or strengthening exercises.
Trial registration number: NCT02850503.

WHAT IS ALREADY KNOWN ON THIS TOPIC
 Rotator cuff related shoulder pain (RCRSP) accounts for approximately 70% of shoulder pain consultations and it may lead to pain, reduced function, decreased muscle performance, altered shoulder kinematics, and maladaptive pain behaviours like kinesophobia and catastrophisation.
 Education and exercise are two of the most frequently used interventions for RCRSP with evidence supporting their effectiveness.
 No study has directly compared education, strengthening exercises and motor control to better highlight recovery over time as well as the choice of intervention provided.

WHAT THIS STUDY ADDS
 All three interventions (education only, education and motor control exercises, education and strengthening exercises) were effective in improving symptoms and functional limitations in individuals with RCRSP, but the addition of motor control or strengthening exercises did not lead to significantly better outcomes than education alone.
 A high quality randomised strengthening exercises regimen did not lead to additional strength improvement compared with education alone or education combined with motor control exercises.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY
 Clinicians could consider using education as a stand-alone intervention for the management of patients with RCRSP as the addition of exercise to education did not improve outcomes.
 More research is needed to determine when including motor control or strengthening exercises in the rehabilitation of RCRSP will provide the most benefit.

INTRODUCTION
 Rotator cuff-related shoulder pain (RCRSP) accounts for approximately 70% of shoulder pain consultations. It is associated with reduced function, decreased muscle performance, altered shoulder kinematics, and maladaptive pain behaviours such as kinesophobia and catastrophisation.^{1,2} Management commonly involves education, exercise,^{3,4} medication, injection and surgery.^{5,6} However, 50% of individuals do not report significant improvement.⁷

Check for updates
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Other Data: M.O. Dubé, F. Desmeules, J.S. Lewis, et al. *BMJ Open* 2023;17:e007463.

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ACRM Archives of Physical Medicine and Rehabilitation

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 Archives of Physical Medicine and Rehabilitation 2023, 104(12):2023-2031

REVIEW ARTICLE

The Efficacy of Higher Versus Lower Dose Exercise in Rotator Cuff Tendinopathy: A Systematic Review of Randomized Controlled Trials

Peter Malliaras, PhD,¹ Renea Johnston, PhD,² Gabriele Street, BPhysio,³ Chris Littlewood, PhD,⁴ Kim Bennell, PhD,⁵ Terry Haines, PhD,⁶ Rachelle Buchbinder, PhD⁷

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Abstract
Objective: To compare the effectiveness and harms of higher exercise load or higher volume, with lower exercise load or lower volume in individuals with rotator cuff tendinopathy.
Design: Systematic review.
Data Sources: Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, and CINAHL, from inception to March 2019.
Study Selection: Randomized controlled trials comparing higher versus lower dose exercise that investigated function and pain (overall, activity, night) and adverse event outcomes were independently determined by 2 reviewers.
Data Extraction: Two authors independently extracted data and assessed risk of bias using the Cochrane tool. The primary outcome was at least 6 weeks to 3 months (either endpoint included up to 6 weeks and beyond 3 months) and the Oakes of Recommendation, Assessment, Development and Evaluation was used to assess evidence certainty.
Data Synthesis: These trials (N=28), none at low risk of bias for all domains, were included. Low-certainty evidence (1 trial, N=107) indicated improved function (20 points [95% confidence interval, 12-28] on a 0-100 point scale) with higher load and volume exercise at 3 months, but this was not clinically important between-group difference in activity or night pain (overall pain not reported). Very low-certainty evidence (1 trial, N=120) indicated higher load exercise conferred an function benefit over lower load exercise at 6 weeks. Very low-certainty evidence (1 trial, N=61) indicated benefit of low-volume exercise in function with higher versus lower volume exercise at 3 months and clinically important benefit at more than 3 months (pain outcomes not reported). The risk of adverse events was unclear.
Conclusions: There are few studies that have investigated higher dose exercise for rotator cuff tendinopathy. There was low to very low certainty evidence suggesting the value of higher exercise dose in individuals with rotator cuff tendinopathy.
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Shoulder pain is estimated to have a prevalence between 15% and 30% in the general population, with prevalence increasing with age. Rotator cuff tendinopathy is the most common cause, accounting for up to 80% of all cases of shoulder pain in primary care. Although often self-limiting, up to 50% of patients who present for care may continue to experience ongoing pain and disability beyond 12 months. This results in significant morbidity and health resource utilization, given that shoulder function is essential to personal hygiene, dressing, and work.¹

Keywords:
 Exercise, Rotator Cuff Tendinopathy, Systematic Review

DOI:10.1093/ptm/pzad012. See this article © 2023 by the American Congress of Rehabilitation Medicine <https://doi.org/10.1093/ptm/pzad012>

What about exercise then?

RESEARCH

Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study

Theresa Holmgren PhD student¹, Hanna Björnsson Halgreen PhD student², Brigitta Öberg professor³, Lars Adolphson professor⁴, Kajsa Johansson senior lecturer⁵

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Abstract Objectives To evaluate if a specific exercise strategy, targeting the rotator cuff and scapular stabilisers, improves shoulder function and pain more than nonspecific exercises in patients with subacromial impingement syndrome. Primary outcomes The need for subsequent subacromial decompression.

Design Randomised, participant and single assessor blinded, controlled study.

Setting Department of orthopaedics in a Swedish university hospital.

Participants 122 patients with long standing pain due to chronic persistent subacromial impingement syndrome in whom earlier conservative treatment had failed, recruited through orthopaedic specialists.

Interventions The specific exercise strategy consisted of strengthening exercises: exercises for the rotator cuff and scapulothoracic stabilisers for the scapulothoracic stabilisers in combination with manual mobilisation. The control exercise programme consisted of strengthening exercises for the rotator cuff and scapulothoracic stabilisers for the rotator cuff and scapulothoracic stabilisers for the scapulothoracic stabilisers in combination with manual mobilisation.

Main outcome measures The primary outcome was the Constant-Murley shoulder assessment score evaluating shoulder function and pain. Secondary outcomes were subsequent global treatment of change because of treatment and decision regarding surgery.

Results Most of WHO participants completed the 12 week study. There was a significantly greater improvement in the Constant-Murley score in the specific exercise group than in the control exercise group (24 points (95% confidence interval 19 to 29) vs 19 points (95% confidence interval 14 to 24), mean difference between groups 10 points (95% CI 6 to 14). Significantly more patients in the specific exercise group required additional treatment (defined as large improvement or reoperation) in the primary global

assessment of change because of treatment (49% (95% CI 32% to 64%) odds ratio 7.0, 95% CI 1.8 to 18.0, P=0.007). A significantly lower proportion of patients in the specific exercise group subsequently chose to undergo surgery (20% (95% CI 14% to 28%) odds ratio 2.1, 95% CI 1.0 to 4.0).

Conclusion A specific exercise strategy, focusing on strengthening scapulothoracic stabilisers for the rotator cuff and scapulothoracic stabilisers for the scapulothoracic stabilisers, is effective in reducing pain and improving shoulder function in patients with persistent subacromial impingement syndrome. In addition, the exercise strategy reduces the need for subsequent subacromial decompression within the three month duration used in the study.

Trial registration Clinical Trials NCT02021073

Introduction Subacromial impingement syndrome is said to have multiple causes.¹ Several structures, such as the subacromial bursa, the tendons of the rotator cuff, the acromion, the coracoacromial ligaments, and the corpect ligament tendons of the longer brachial muscles, are involved in the pathogenesis of subacromial impingement syndrome (fig 1). Multiple factors have been proposed as contributing to the development of subacromial impingement syndrome, including altered shoulder kinematics associated with dysfunction of the rotator cuff and scapular muscles,^{2,3} acromial bursitis,⁴ poor posture,^{5,6} and overuse secondary to sustained intensive work.^{7,8}

Conservative treatment is the first choice, often with corticosteroid injections or different physiotherapy interventions, as both.⁹ Some studies have reported specific exercise treatment to be effective,^{10,11} but the substantial evidence for its effectiveness is uncertain because of the limited number of studies and several with methodological concerns.^{12–15} Therefore

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Data included in this paper can be found at <https://www.clinicaltrials.gov/study/NCT02021073>

Progressive exercise compared with best practice advice, with or without corticosteroid injection, for the treatment of patients with rotator cuff disorders (GRASP): a multicentre, pragmatic, 2 x 2 factorial, randomised controlled trial

Julie Hayward PhD student¹, Emma Stone PhD student², Mike Doherty PhD student³, Lucy Corbett Senior Lecturer⁴, Helen Gage PhD student⁵, Andrew Carr PhD student⁶, Zoran Hodovic PhD student⁷, Chris Littlewood PhD student⁸, Kamil Baku PhD student⁹, Alan Gray PhD student¹⁰

Background Corticosteroid injections and physiotherapy exercise programmes are commonly used to treat rotator cuff disorders but the treatment effectiveness is uncertain. We aimed to compare the clinical effectiveness and cost-effectiveness of a progressive exercise programme with a single session of best practice physiotherapy advice, with or without corticosteroid injection, in adults with a rotator cuff disorder.

Methods In this pragmatic, multicentre, superiority, randomised controlled trial (2 x 2 factorial), we recruited patients from 20 UK National Health Service sites. We included patients aged 18 years or older with a rotator cuff disorder (low episode within the past 6 months). Patients were excluded if they had a history of significant shoulder trauma (eg, abduction fracture, or full-thickness tear requiring surgery), neurological disease affecting the shoulder, other shoulder conditions (eg, inflammatory arthritis, frozen shoulder, or glenohumeral joint instability), received corticosteroid injection or physiotherapy for shoulder pain in the past 6 months, or were being considered for surgery. Patients were randomly assigned (computer generated system, 1:1) to progressive exercise (six sessions), best practice advice (one session), corticosteroid injection (one progressive exercise, or corticosteroid injection then best practice advice). The primary outcome was the Shoulder Pain and Disability Index (SPADI) score over 12 months, analysed on an intention-to-treat basis (statistical significance set at P<0.05). The trial was registered with the International Standard Randomised Controlled Trial Register, ISRCTN16359396, and EudraCT, 2016-002995-18.

Findings Between March 16, 2017, and May 2, 2019, we screened 2287 patients. 768 patients were randomly assigned to progressive exercise (n=374), best practice advice (n=70), corticosteroid injection then progressive exercise (n=32), or corticosteroid injection then best practice advice (n=78). Over 12 months, SPADI data were available for 646 (90%) patients in the progressive exercise group, 164 (90%) in the best practice advice group, 177 (97%) in the corticosteroid injection then progressive exercise group, and 175 (98%) in the corticosteroid injection then best practice advice group. We found no evidence of a difference in SPADI score between progressive exercise and best practice advice when analysed over 12 months (adjusted mean difference -0.6 (95% CI -1.4 to 0.2)). We also found no evidence of a difference between corticosteroid injection compared with no injection when analysed over 12 months (-1.1 (-1.4 to -0.7) to 0.2). No serious adverse events were reported.

Interpretation Progressive exercise was not superior to a best practice advice session with a physiotherapist in improving shoulder pain and function. Subacromial corticosteroid injection provided no long-term benefit in patients with rotator cuff disorders.

Funding UK National Institute for Health Research (Health Research Assessment Programme).

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Introduction Shoulder pain is common, with approximately 1% of adults aged 45 years and older presenting to primary care services with a new episode of shoulder pain each year, accounting for 2.4% of all general practice (GP) consultations in the UK.¹ Shoulder pain includes rotator cuff, the most common cause, accounting for 70% of cases. Rotator cuff disorders are often associated with subacromial

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Data included in this paper can be found at <https://www.clinicaltrials.gov/study/NCT02257477>

Does the addition of motor control or strengthening exercises to education result in better outcomes for rotator cuff-related shoulder pain? A multiarm randomised controlled trial

Marc-Olivier Dubé PhD student^{1,2}, François Desmeules PhD student³, Jeremy S Lewis PhD student⁴, Jean-Sébastien Roy PhD student⁵

Additional supplemental material is published online only. To view these files please visit the journal online for this article. See the article for full text and supplementary information.

Objective To compare the short-term, mid-term and long-term effects between three interventions (education only, education and strengthening exercises, education and motor control exercises) for rotator cuff-related shoulder pain (RCRSP) on pain, rotator and shoulder function, muscle performance, and maladaptive pain behaviours like kinesiophobia and catastrophisation.

Methods 123 adults presenting with RCRSP took part in a 13-week intervention. They were randomly assigned to 1 of 3 intervention groups. Symptoms and function were evaluated at baseline and at 3, 6 weeks, 12 weeks, and 24 weeks using the Disability of Arm, Shoulder and Hand Questionnaire (DASH) (primary outcome) and Western Ontario Maculistra-Cuff Index (WOMAC). Linear mixed modelling was used to compare the effects of the three programmes on the outcomes.

Results After 24 weeks, between-group differences were 2.1 (7 to 2.8) (motor control vs education), 1.2 (4.3 to 7.4) (progressing vs education) and -3.3 (8.5 to 1.9) (motor control vs strengthening) for the DASH and 0.3 (0.3 to 1.7) (motor control vs education), 1.3 (7.8 to 10.2) (strengthening vs education) and 0.2 (-0.5 to 1.0) (motor control vs strengthening) for the WOMAC. There was a significant group-by-time interaction (p=0.04) with education but follow-up analysis did not reveal any clinically meaningful between-group differences. There was no significant group-by-time interaction (p=0.39) for the WOMAC. Between-group differences were reported the overall clinically important difference of QuickDASH or WOMAC.

Conclusion In people with RCRSP, the addition of motor control or strengthening exercises to education did not lead to larger improvements in symptoms, and function compared with education alone. Further research should investigate the value of providing targeted care by identifying individuals who may only need education and those who would benefit from the addition of motor control or strengthening exercises. Trial registration number: NCT02850503.

Introduction Rotator cuff-related shoulder pain (RCRSP) accounts for approximately 70% of shoulder pain consultations. The associated role of reduced function, decreased muscle performance, altered shoulder biomechanics, and maladaptive pain behaviours such as kinesiophobia and catastrophisation,^{1–3}

Correspondence to: Marc-Olivier Dubé, marc-olivier.dube@ulb.ac.be
Data included in this paper can be found at <https://www.clinicaltrials.gov/study/NCT02850503>

The Efficacy of Higher Versus Lower Dose Exercise in Rotator Cuff Tendinopathy: A Systematic Review of Randomized Controlled Trials

Peter Malliaras, PhD,¹ Renea Johnston, PhD,² Gabriele Street, BPhysio,³ Chris Littlewood, PhD,⁴ Kim Bennell, PhD,⁵ Terry Haines, PhD,⁶ Rachelle Buchbinder, PhD⁷

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Objective To compare the effectiveness and harms of higher exercise dose, including higher exercise load or higher volume, with lower exercise dose (lower load or lower volume) in individuals with rotator cuff tendinopathy.

Design Systematic review.

Data Sources Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, and CINAHL, from inception to March 2019.

Study Selection Randomised controlled trials comparing higher versus lower dose exercise that investigated function and pain (overall, activity, night) and adverse event outcomes were independently determined by 2 reviewers.

Data Extraction Two authors independently extracted data and assessed risk of bias using the Cochrane tool. The primary outcome was at least 6 weeks to 3 months (either endpoint included up to 6 weeks and beyond 3 months) and the Cochrane of Recommendation, Assessment, Development and Evaluation was used to assess evidence certainty.

Data Synthesis This trial (N=281), none at low risk of bias for all domains, were included. Low-certainty evidence (1 trial, N=107) indicated improved function (DASH point (95% confidence interval, 12.2) on a 0-100 point scale) with higher load and volume exercise at 3 months, but this was not clinically important between-group difference in activity or night pain (overall pain not reported). Very low-certainty evidence (1 trial, N=126) indicated higher load exercise conferred an effect on function benefits over lower load exercise at 6 weeks. Very low-certainty evidence (1 trial, N=61) indicated benefits of low-intensity exercise in function with higher versus lower volume exercise at 3 months and clinically important benefits at more than 3 months from volume not reported. The risk of adverse events was unclear.

Conclusions There are few studies that have evaluated higher dose exercise for rotator cuff tendinopathy. There was low to very low certainty and conflicting evidence regarding the value of higher exercise dose in individuals with rotator cuff tendinopathy.

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Shoulder pain is estimated to have a prevalence between 15% and 30% in the general population, with prevalence increasing with age. Rotator cuff tendinopathy is the most common cause, accounting for up to 80% of all cases of shoulder pain in primary care. Although often self-limiting, up to 50% of patients who present for care may continue to experience ongoing pain and disability beyond 12 weeks. This results in significant morbidity and health resource utilization, given that shoulder function is essential to personal hygiene, dressing, and work.¹

▪ SPECIFIC BETTER THAN NON-SPECIFIC

▪ SUPERVISED PROGRESSIVE EXERCISE NOT BETTER THAN ADVISE (ALSO ABOUT EXERCISE)

▪ NO TYPE OF EXERCISE FOUND SUPERIOR (AND NOT EVEN TO ADVISE ALONE)

▪ DOSE MAY BE IMPORTANT

Stratified Care?

Pathophysiology? (e.g. calcification)

Dysfunctions? (e.g. reduced strength)

“Shoulder symptom modification procedure”

Psychosocial factors (e.g. Fear-avoidance)



The Prognosis



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Original article

Less than half of patients in secondary care adheres to clinical guidelines for subacromial pain syndrome and have acceptable symptoms after treatment: A Danish nationwide cohort study of 3306 patients

Mikkel Bek Clausen ^{a,*}, Mikas Bjørn Merrild ^a, Kika Holm ^a, Mads Welling Pedersen ^a,
Lars Louis Andersen ^b, Mette Kreutzfeldt Zebis ^a, Thomas Linding Jakobsen ^c, Kristian Thorborg ^d

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Background



Strengthening



Stretching



Mobility



Postural/scapula

Clinical Guidelines:

- Minimum 3 months of exercise therapy
- No recommendation regarding types of exercise

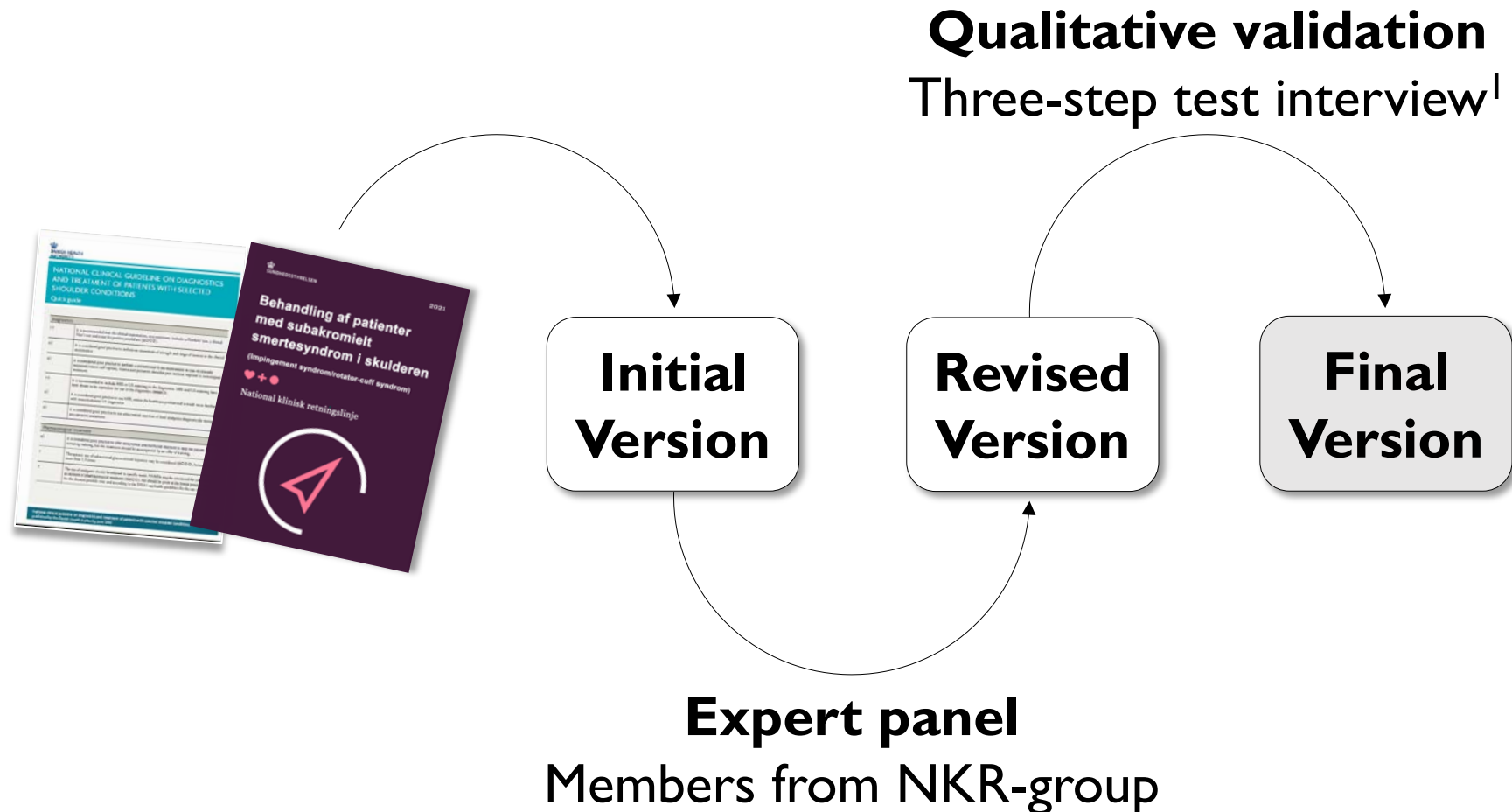
Study design

- **Nation-wide (All patients)**
- **Identified in national register**
- **Invites 3.5 mths after diagnosis**
- **Patient-reported data on content and outcome of care**

eBoks



Study design – Content of care



¹Hak et al., 2008

Study design – Content of care

- **Surgery since index (yes/no)**
- **Exercise for current shoulder disorder (yes/no)**
- **Number of weeks with exercise (count)**
- **Specific types of exercise (yes/no)**



Mobility



Postural/scapula



Strengthening



Stretching

Study design – Outcome of care

Patient acceptable symptom state (PASS)



VS



Global impression of change (GIC)

Much improved or cured

Improved

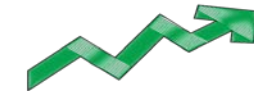
Small improvement

Same

Little worse

Worse

Much worse



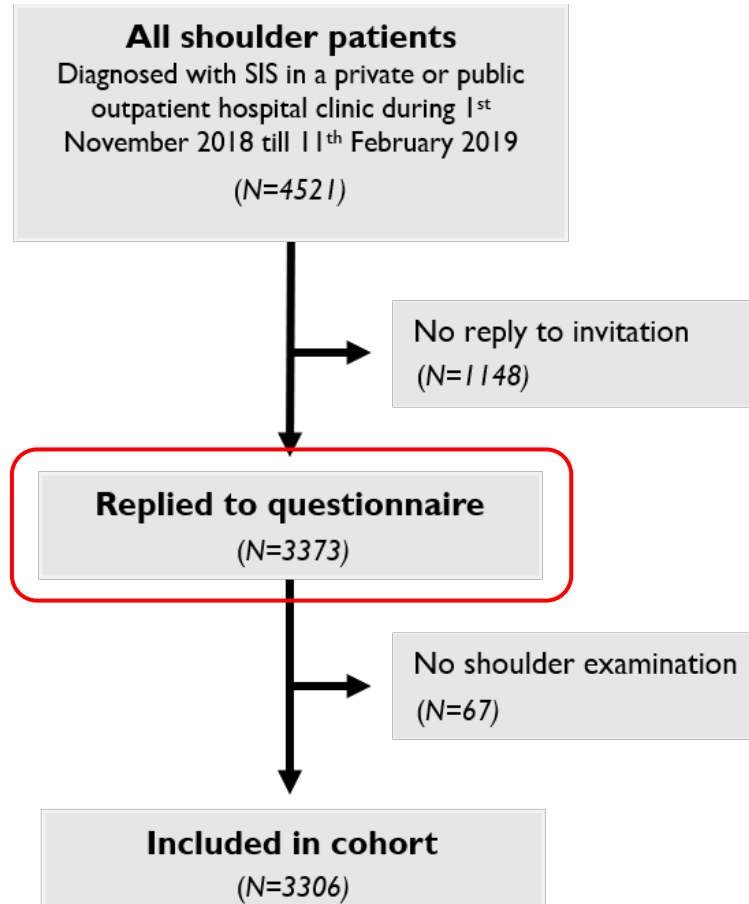
Improved

Not improved

Results

Results

75% response rate

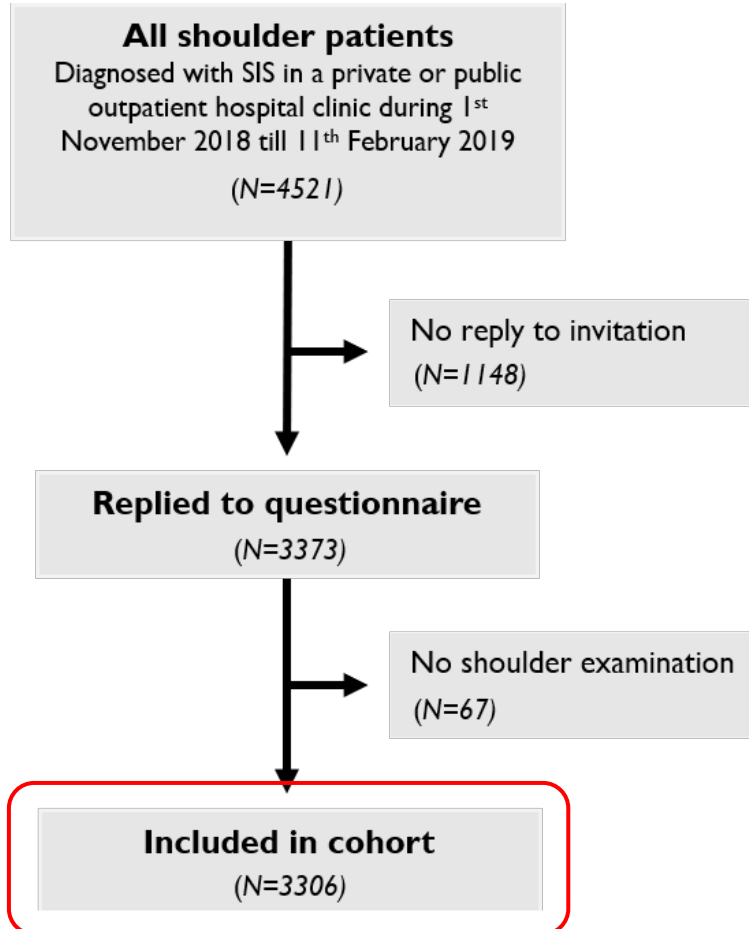


Results

“Exercises for current shoulder disorder”

Table 1

Symptom duration (months)	12	[7; 24]
Gender (% females)	51%	(49%–53%)
Age (years)	56	[49; 65]
Dominant side affected (% yes)	57%	(55%–59%)
Gradual onset (% yes)	63%	(61%–64%)
Time between diagnosis and follow-up (weeks)	17	[15; 18]

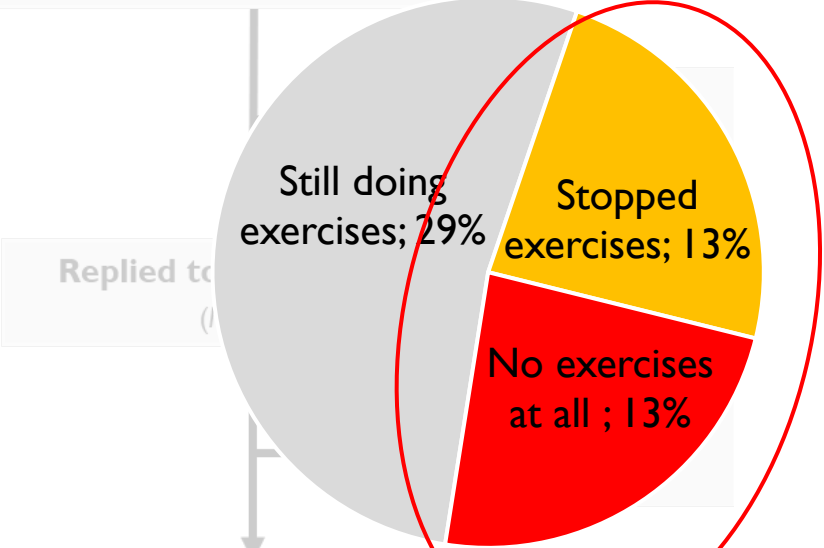
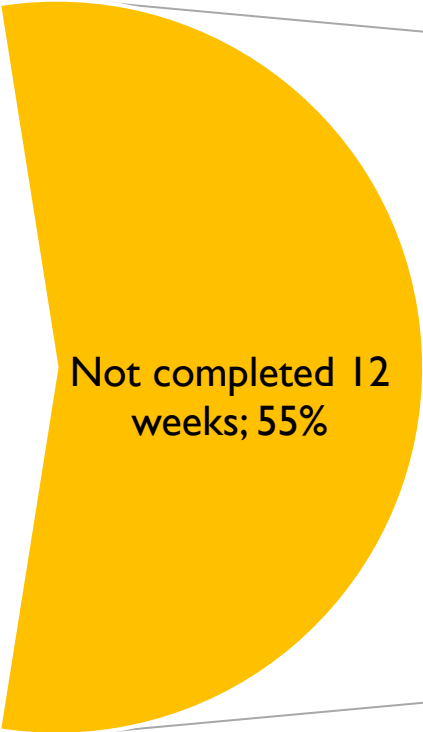


Results

“Exercises for current shoulder disorder”



All shoulder patients
Diagnosed with SIS in a private or public outpatient hospital clinic during 1st November 2018 till 11th February 2019
(N=4521)



26%

Replied to
(N=3306)

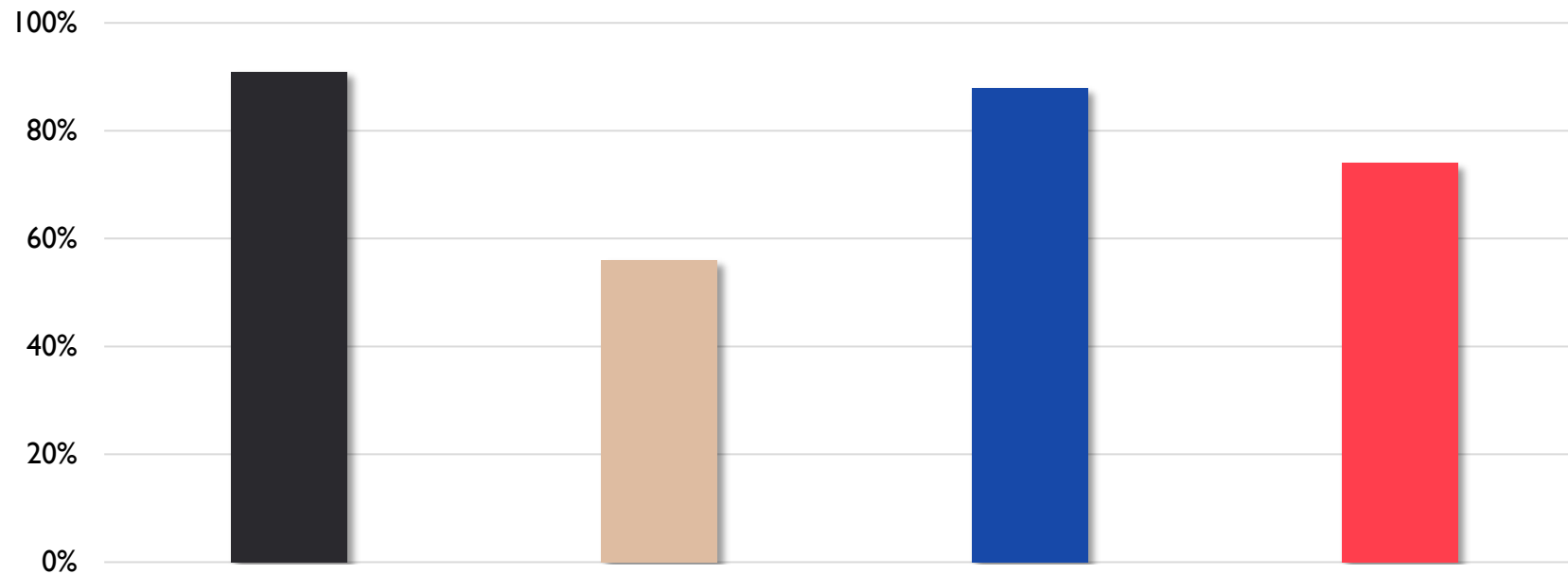
Included in cohort
(N=3306)

Results

Non-operative

(N=2513)

“Content of care”



Mobility



Postural/scapula



Strengthening



Stretching

Results

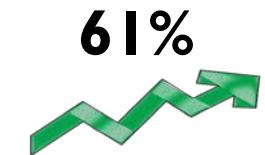
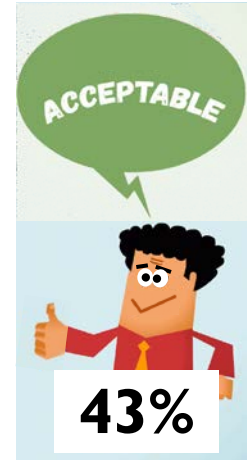
Non-operative

(N=2513)

“Outcome of care”

Table 3

	Non-operative care	
Patient acceptable symptom state	43%	(41%–45%)
Global impression of change		
Much improved or cured	20%	(18%–21%)
Improved	16%	(15%–18%)
Small improvement	25%	(23%–27%)
Same	26%	(24%–28%)
Little worse	5%	(4%–6%)
Worse	4%	(3%–5%)
Much worse	3%	(3%–4%)



Results

Non-operative

(N=2513)

“Content and outcome of care”

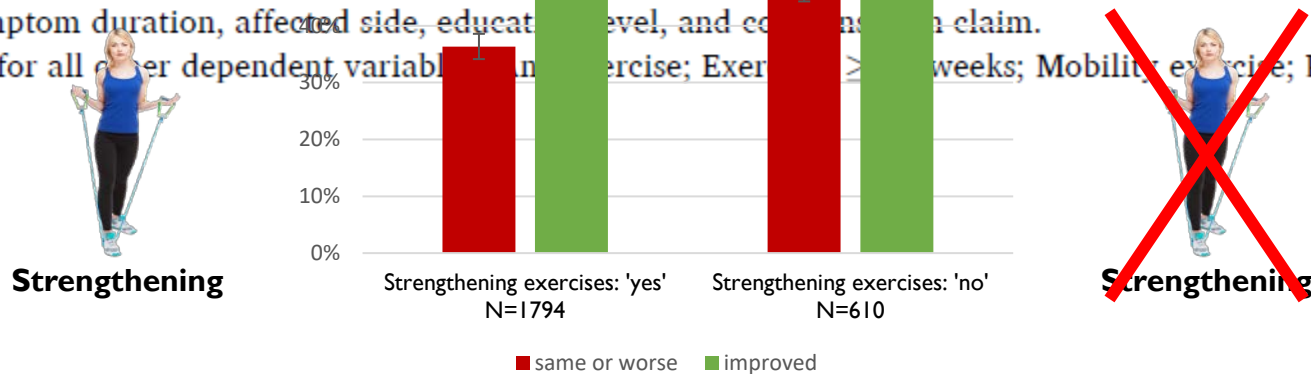
Table 4

The relationship between exercise parameters and the odds of improvement. Dependent variable is a dichotomized version of GIC (slightly better/better/much better/recovered vs. unchanged/slightly worse/worse/much worse).

	Univariate		Confounder adjusted ^a		Fully adjusted ^b	
	OR	95%CI	OR	95%CI	OR	95%CI
Any exercise (yes)						
Exercises ≥ 12 weeks	0.94	(0.80–1.10)	1.05	(0.88–1.24)		
Mobility exercise (yes)	1.40	(1.15–1.69)	1.54	(1.25–1.88)		
Posture exercise (yes)	0.85	(0.72–1.00)	0.94	(0.79–1.12)		
Strengthening exercise (yes)	1.51	(1.25–1.82)	1.69	(1.39–2.05)		
Stretching exercise (yes)	1.08	(0.91–1.28)	1.15	(0.96–1.37)		

^a Adjusted for age, gender, symptom duration, affected side, education level, and compensation claim.

^b In addition to ^a also adjusted for all other dependent variables (any exercise; Exercises ≥ 12 weeks; Mobility exercise; Posture exercise; Strengthening exercise; Stretch exercise).



Summary



Less than half adheres to recommendations
(12 weeks with exercise therapy)

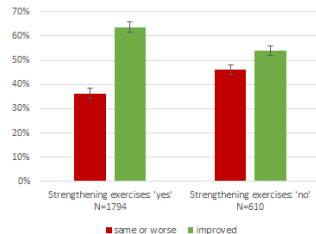
ALSO for for surgically treated patients



Less than half reaches PASS



Strengthening



Exercise type related to symptom improvement

Exercise dose and adherence

THE SEXSI-TRIAL

The American Journal of Sports Medicine

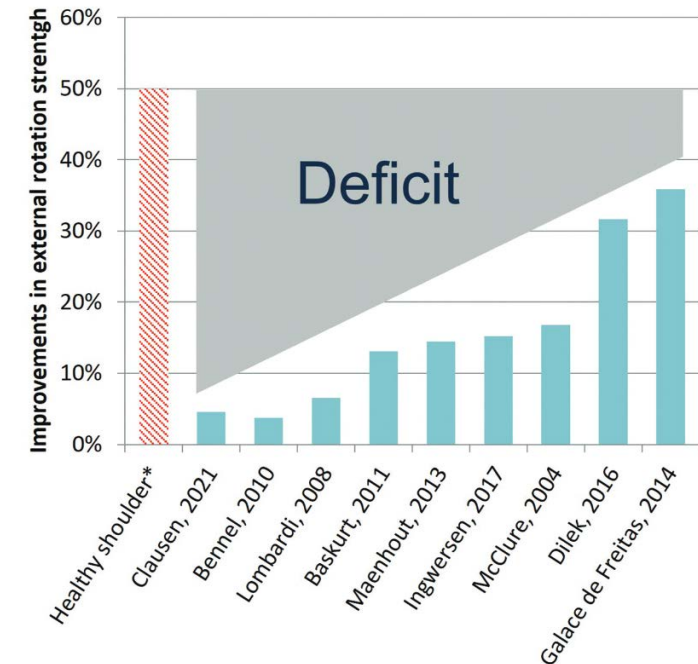


Effectiveness of Adding a Large Dose of Shoulder Strengthening to Current Nonoperative Care for Subacromial Impingement

A Pragmatic, Double-Blind Randomized Controlled Trial (SExSI Trial)

Mikkel Bek Clausen,^{*†‡} PhD, Per Hölmich,[†] DMSc, Prof., Michael Rathleff,^{§||} PhD, Prof., Thomas Bandholm,^{¶#} PhD, Prof., Karl Bang Christensen,^{**} PhD, Mette Kreutzfeldt Zebis,[‡] PhD, and Kristian Thorborg,^{†¶} PhD, Prof.

Investigation performed at the Sports Orthopedic Research Center–Copenhagen, Department of Orthopedic Surgery, Amager-Hvidovre Hospital, Institute of Clinical Medicine, University of Copenhagen, Copenhagen, Denmark



Methods

Study design



Eligibility criteria

- ≥ 3 positive SIS-tests & > 3 mths
- Excl. other primary conditions

RANDOM

ADD-ON INTERVENTION

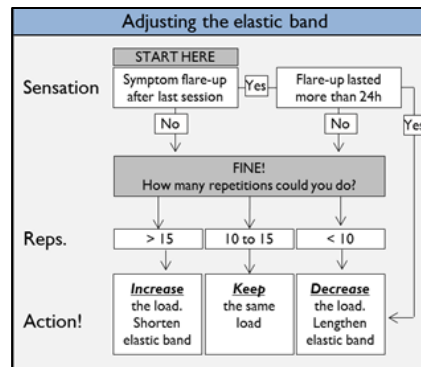
USUAL CARE

USUAL CARE

Study design

“Pain is OK, as long as it is bearable. This is not a sign of danger.

Pain system affected by long lasting pain, hence not a liable indicator of potential damage...“



E> **ADD-ON INTERVENTION**
EXERCISE 3

10 w

16 w

**EXERCISE 1:
SEATED EXTERNAL ROTATION**



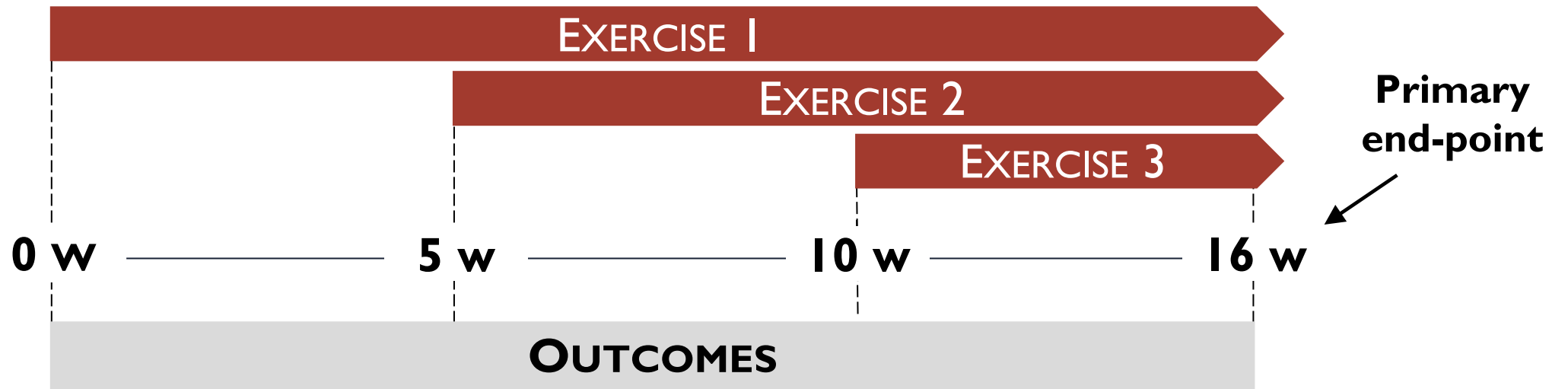
**EXERCISE 2:
STANDING ABDUCTION**



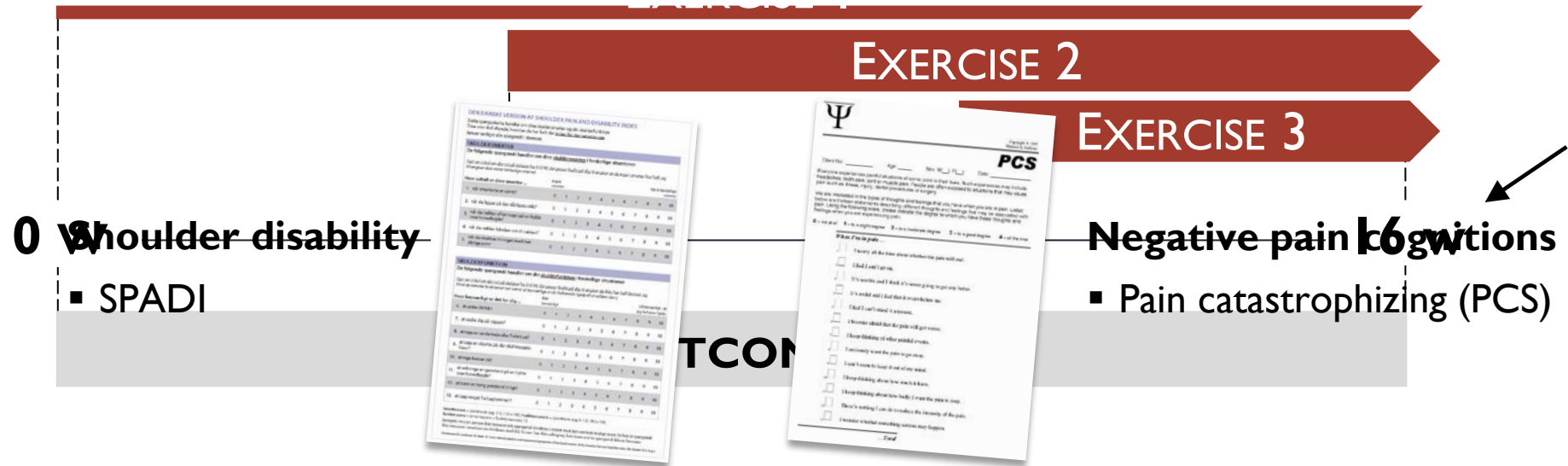
**EXERCISE 3:
STANDING EXTERNAL ROTATION**



Study design



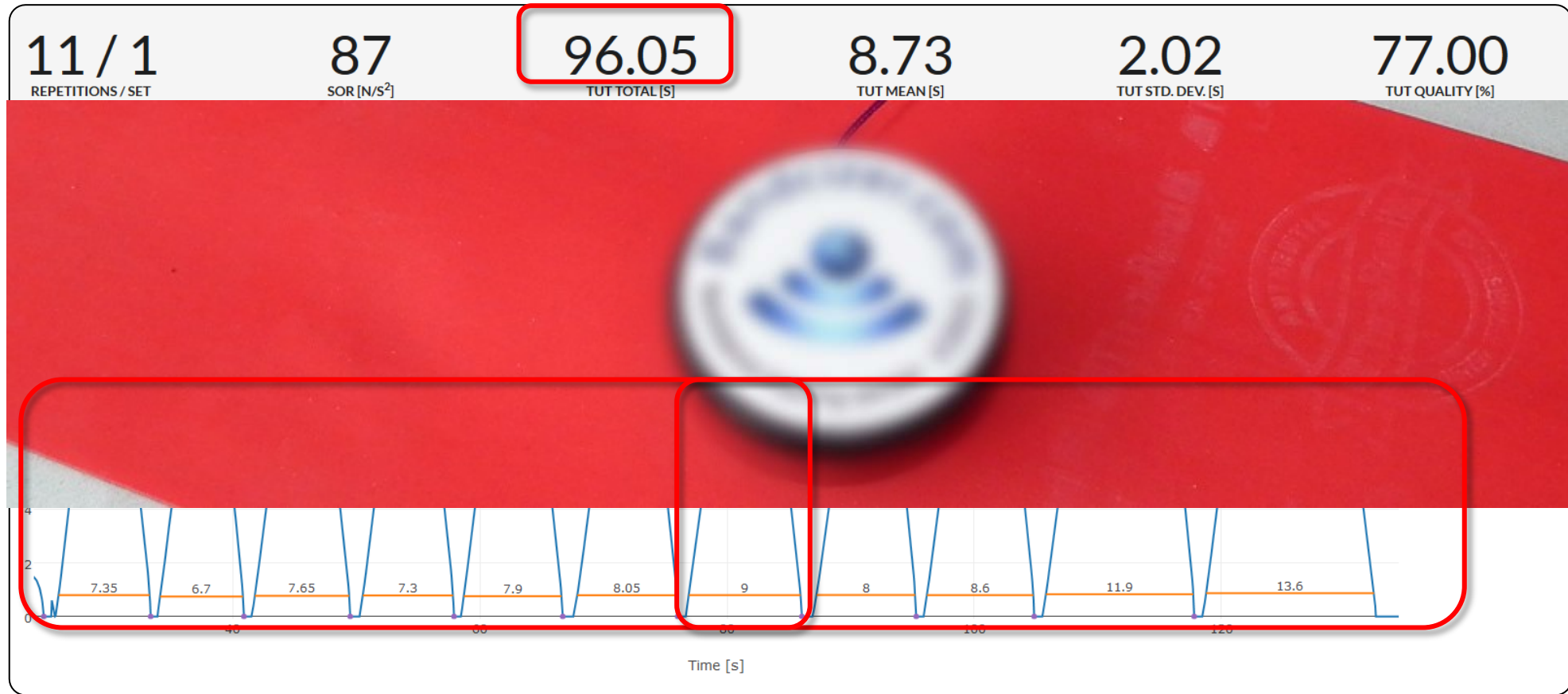
Study design



Adherence

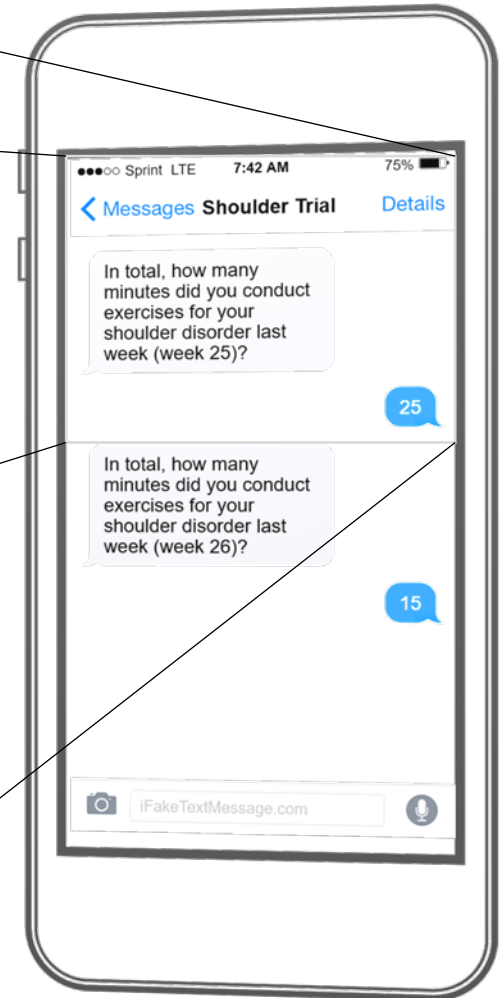
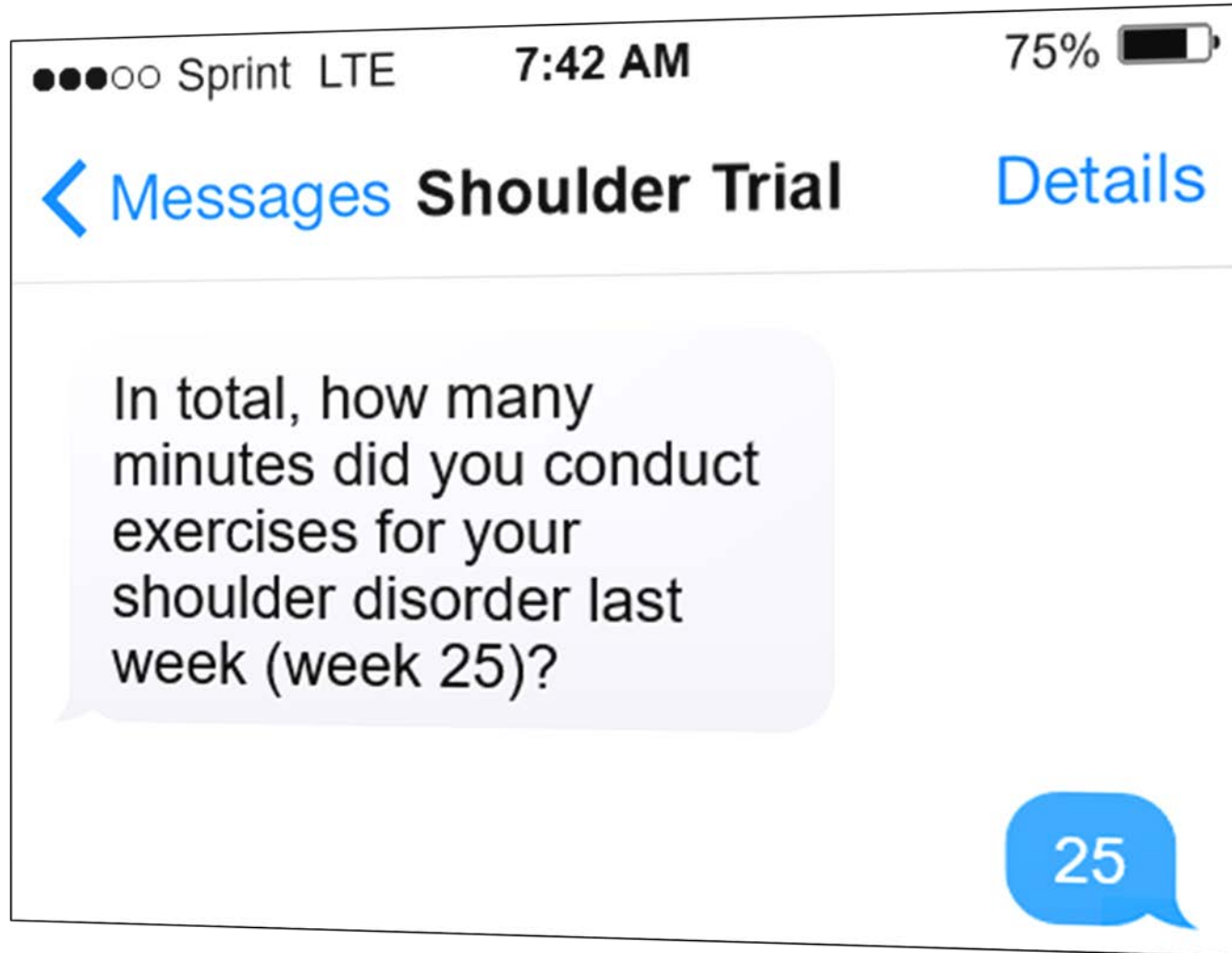
ADD-ON INTERVENTION

Total TUT (Time-under-tension)



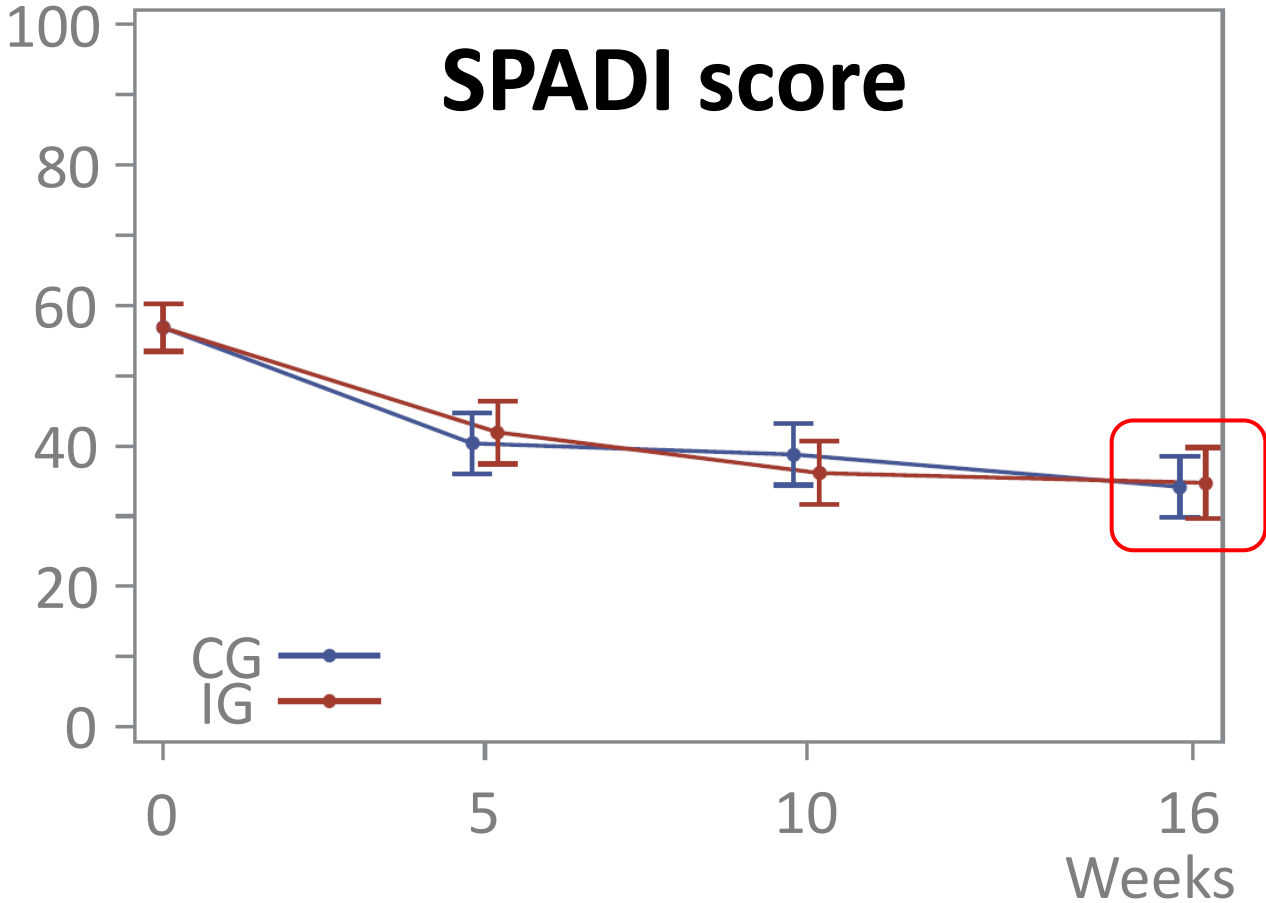
Time spent on exercise

USUAL CARE



Results

Results



No difference
0.6 points
(95%CI -5.5 to 6.6)

Control Group (n=100)

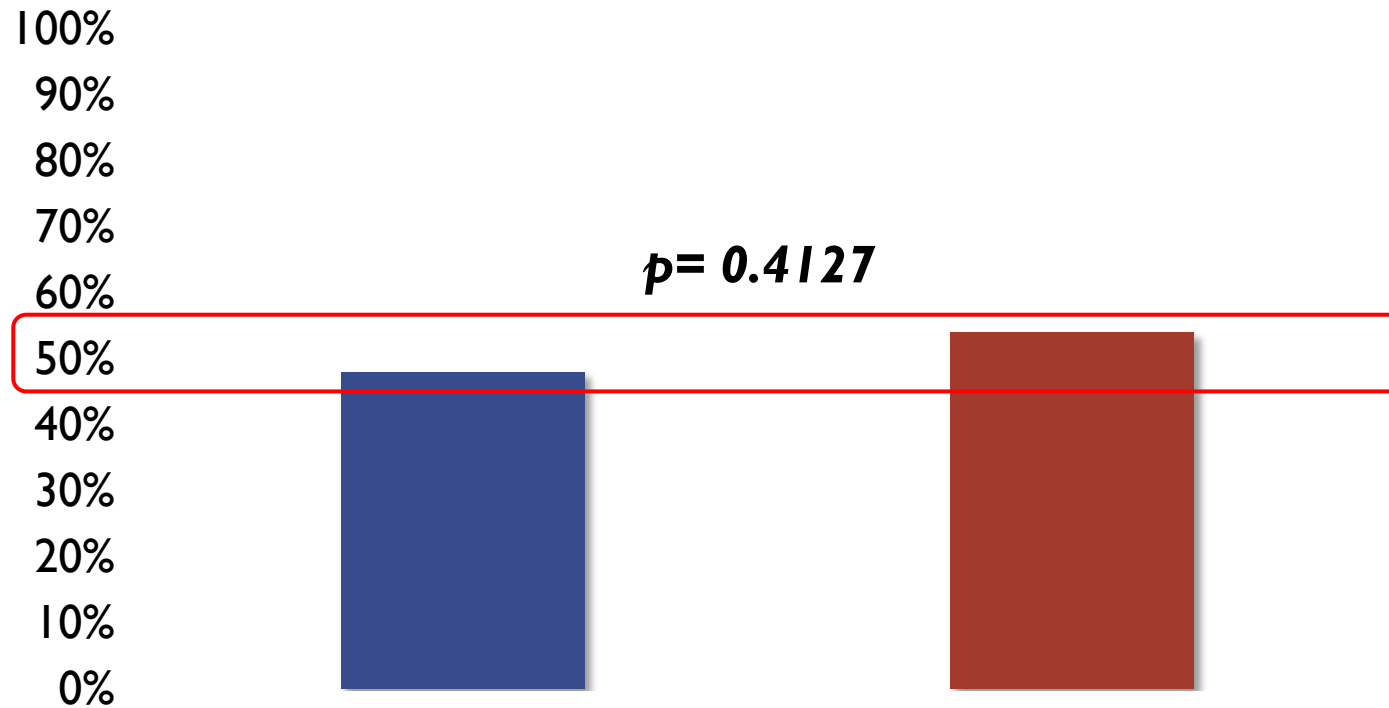
U

Intervention Group (n=100)

U + A

Results

Patient acceptable symptom state 16 w (% yes)



Control Group (n=100)

Intervention Group (n=100)

U

U

+

A



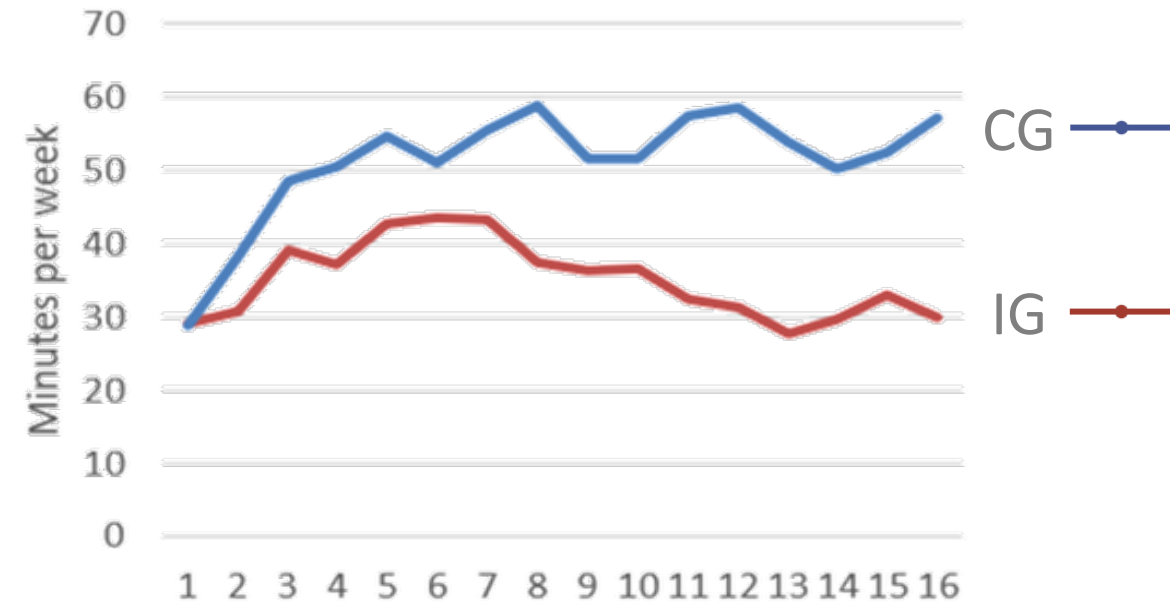
Results

Adherence SPADI score



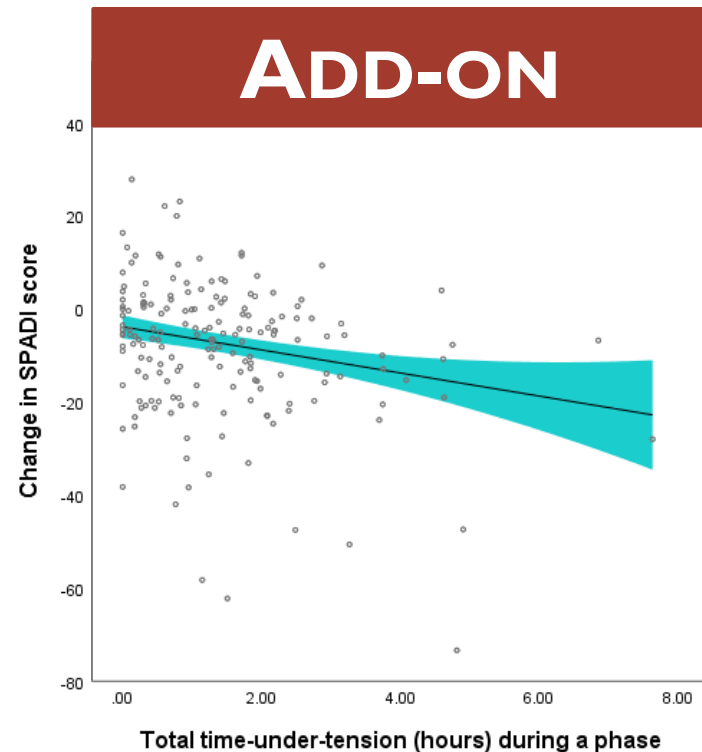
Average total TUT
≈ 10 000 sec

Usual care exercise time

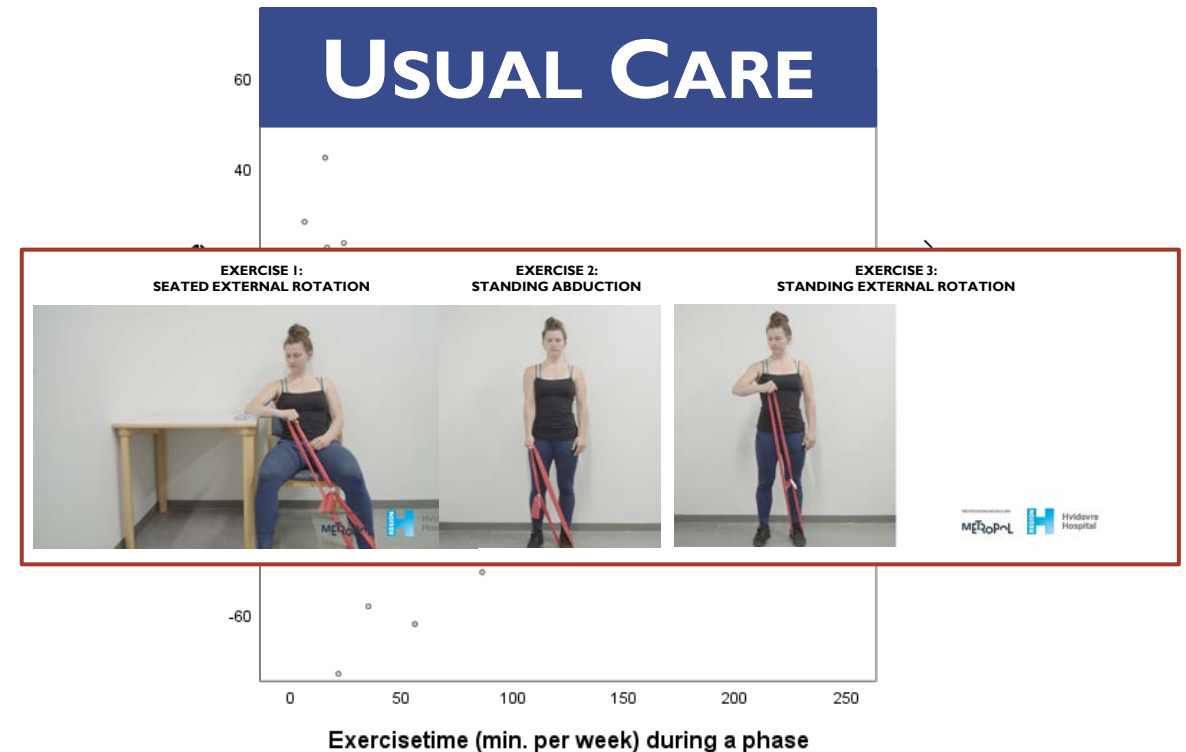


Exercise adherence

Does it matter?



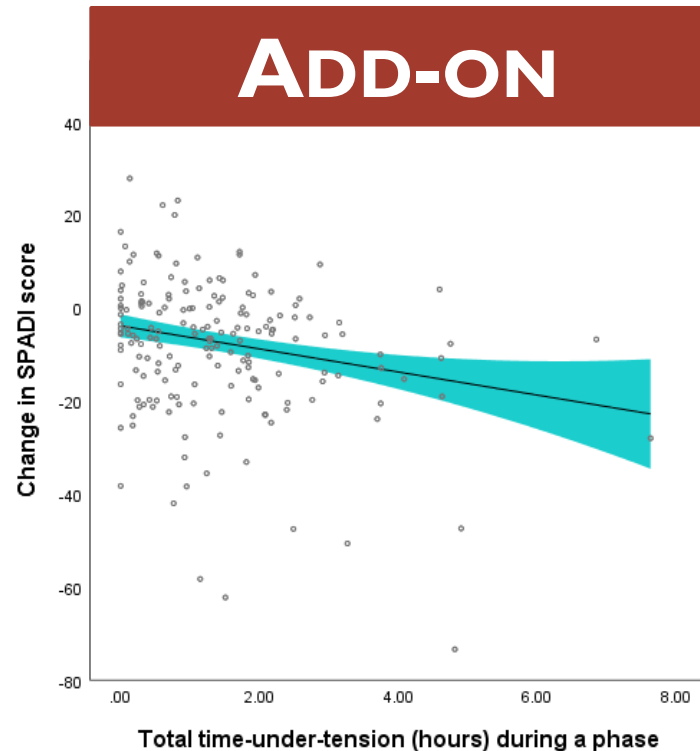
3 SPADI point (95%CI: 1 to 4)
per hour time-under-tension



3 SPADI point (95%CI: 0.6 to 6)
per hour spend each week during 5-6 weeks

Exercise adherence

Does it matter?



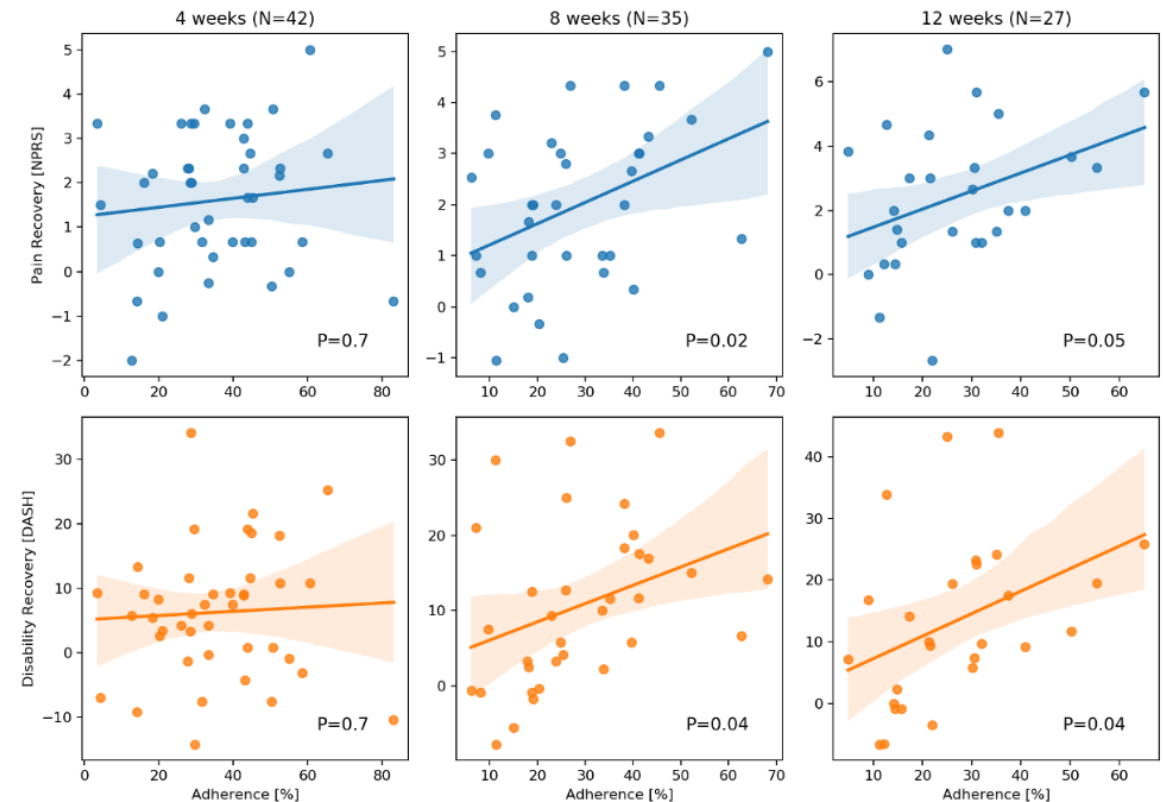
3 SPADI point (95%CI: 1 to 4)
per hour time-under-tension

[Original Paper](#)

Adherence Patterns and Dose Response of Physiotherapy for Rotator Cuff Pathology: Longitudinal Cohort Study

David Burns^{1,2}, MD, PhD; Philip Boyer¹, MSc; Helen Razmjou^{1,3,4}, PT, PhD; Robin Richards^{2,5}, MD; Cari Whyne^{1,2}, PhD

Figure 7. Physiotherapy dose response. Participation was defined as the ratio of physiotherapy exercise measured for a patient to an expectation of 20 minutes per day (100%).



Exercise adherence – It **Does** Matter



“Just do it!”

SUMMARY...

DIAGNOSIS AND TERMINOLOGY UNCLEAR

VERY LARGE AND HOMOGENEOUS GROUP

SIGNIFICANT COSTS – INDIVIDUAL AND FOR SOCIETY

MANY SUFFER FOR A LONG TIME

UNCERTAINTY ABOUT BEST EXERCISE-BASED CARE

ADHERENCE APPEARS TO MAKE A DIFFERENCE

ADHERENCE IS A CHALLENGE

