



Comparison of three types of exercise in the treatment of rotator cuff tendinopathy/shoulder impingement syndrome: A randomized controlled trial

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Abstract

Objectives To assess the efficacy of three different exercise programmes in treating rotator cuff tendinopathy/shoulder impingement syndrome.

Design Parallel group randomised clinical trial.

Setting Two out-patient NHS physiotherapy departments in Manchester, United Kingdom.

Participants 120 patients with shoulder pain of at least three months duration. Pain was reproduced on stressing the rotator cuff and participants had full passive range of movement at the shoulder.

Interventions Three dynamic rotator cuff loading programmes; open chain resisted band exercises (OC) closed chain exercises (CC) and minimally loaded range of movement exercises (ROM).

Main outcomes Change in Shoulder Pain and Disability Index (SPADI) score and the proportion of patients making a Minimally Clinically Important Change (MCIC) in symptoms 6 weeks after commencing treatment.

Results All three programmes resulted in significant decreases in SPADI score, however there were no significant differences between the groups. Participants making a MCIC in symptoms were similar across all groups, however more participants deteriorated in the ROM group. Dropout rate was higher in the CC group, but when only patients completing treatment were considered more patients in the CC group made a meaningful reduction in pain and disability.

Conclusions Open chain, closed chain and range of movement exercises all seem to be effective in bringing about short term changes in pain and disability in patients with rotator cuff tendinopathy.

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Introduction

Shoulder pain is a common causes of primary care consultation [1], affecting 16 to 21% of the general population [2,3] and frequently persisting for many years [4]. One of the

most common causes of shoulder pain is rotator cuff (RC) tendinopathy/shoulder impingement syndrome (SIS) [5] The pathoaetiology is not fully understood, but thought to arise from acute and chronic changes in tendon structure and surrounding bursa [5]. Pain caused by RC tendinopathy/SIS can cause functional impairment and incur significant societal costs, estimated to be £310 m per annum in the United Kingdom [6]. Consequently, patients are frequently referred to physiotherapy to improve their symptoms. Previous studies have demonstrated that exercise shows promising results in

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treating RC tendinopathy/SIS [6], with progressive loading programmes of the RC suggested to be a key component of treatment [6]. However different authors have advocated different loading strategies [7,8] and it is unclear which approach is superior. Therefore, the aim of this study was to compare the efficacy of three different progressive loading programmes in treating patients with RC tendinopathy/SIS. We hypothesised that all loading strategies would result in improvements in symptoms.

Methods

Trial design

A parallel group randomised comparison trial comparing three exercise interventions with a 1:1:1 ratio.

Participants

Participants were eligible for inclusion if they met the following criteria (i) shoulder pain for at least three months; (ii) no passive limitation of range of movement suggestive of adhesive capsulitis; (iii) pain on isometric rotator cuff testing; (iv) pain on Hawkins–Kennedy or empty can tests; (v) able to read and write English.

Participants were excluded according to the following criteria; (i) symptoms of cervical radiculopathy; (ii) diagnosed inflammatory disorder; (iii) neurological disorder; (iv) widespread pain condition; (v) evidence of complete rotator cuff tear (positive drop arm test or Oxford scale grade II or less strength of the rotator cuff); (vi) previous surgery to the affected shoulder. As part of ethical approval, participants were free to drop out of the study at any point without providing a reason.

Study settings

Patients were recruited from two out-patient physiotherapy departments in Manchester, UK between November 2005 and November 2009. Patients were referred from both primary care and secondary care. All patients with shoulder pain were sent an invitation letter and those providing written informed consent completed a pretreatment questionnaire. Participants underwent a standardised assessment and those meeting the inclusion criteria were randomised *via* computer-generated random number tables. Randomisation details were transposed to cards, which were sealed in opaque envelopes and opened at the time of randomisation. The interventions were delivered by eight physiotherapists, who were qualified for between 5 and 16 years. The therapists each delivered all three interventions. Patients not wishing to participate received physiotherapy as usual.

Blinding

It was not possible to blind participants and physiotherapists, due to the nature of the interventions. However, it was made clear in the patient information sheet that exercise had been shown to be effective for treating this condition, however it was unknown whether one type of exercise was better than another. No indication was given which suggested that any of the interventions was potentially superior and it was made clear that all three loading strategies were used for treating this condition. The authors were blinded to treatment allocation when data were analysed.

Study interventions

A literature search was performed to identify studies utilising different exercise modalities in the treatment of RC tendinopathy/SIS. All relevant articles were identified and reviewed by a panel of five experienced physiotherapists. The panel met to discuss these studies and develop the interventions based around best evidence. Generally, previous studies employed dynamic loading strategies for the RC. However, there was no clear consensus as to the optimal method of loading. Therefore three groups were decided upon; minimally-loaded range of movement exercises, open chain loading and closed chain loading exercises (see below). Participants completed three sets of 10 repetitions, twice per day. Participants were advised that they could exercise into pain, but not to the extent where increased pain resulted in a significant reduction in function or to the extent that pain was significantly worse for more than 1 hour afterwards.

In addition, all participants were taught stretching exercises for the anterior and posterior shoulder capsule [8]. These exercises were included as they were part of the protocol previously shown to be efficacious in treating shoulder pain. However, as all participants completed these exercises, the unique treatment in each group was the different loading strategy. Participants were instructed to hold each stretch for 5 seconds and perform five repetitions, twice per day. Participants attended three appointments over 6 weeks, with the exercises progressed in difficulty at each appointment. This treatment schedule was selected as it reflected usual practice in the treating departments at the time of the study. Diagrams were provided to all patients demonstrating the exercise techniques (web Appendix A in Supplementary material).

Open chain resisted exercises (OC)

Participants performed lateral rotation, medial rotation and abduction to approximately 30° using rubber resistance bands. The length of each band was adjusted for each patient so that the band was taught, but not stretched at the starting point of each exercise. The resistance of the band was set by the treating physiotherapist so that the participant reported that the exercise was challenging without being excessively painful and they were able to complete 10 repetitions before

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