Effects of community-deliverable exercise on pain and physical function in adults with arthritis and other rheumatic diseases: a meta-analysis

Kelley GA, Kelley KS, Hootman JM, Jones DL

CRD summary
The authors concluded that community-deliverable exercise improved pain and physical function in adults with the types of arthritis and other rheumatic diseases reported in this review. This conclusion seems reliable and was supported by relevant research recommendations.

Authors' objectives
To evaluate the effects of community-deliverable exercise on pain and physical function in adults with arthritis and other rheumatic diseases.

Searching
PubMed, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), Sport Discus and DAI were searched from 1980 to 2008. Search terms were reported and reference to a full strategy was given. There were no restrictions on language and publication status. Reference lists of relevant studies and reviews were scanned and experts were consulted. Only full-text articles were considered.

Study selection
Eligible studies were randomised controlled trials of community-deliverable exercise interventions of at least four weeks duration offered to adults (18 years and older) with rheumatoid arthritis, osteoarthritis, fibromyalgia, lupus, gout or ankylosing spondylitis. Studies had to contain at least one exercise-only intervention group (aerobic, strength training) and a comparison group (no intervention, usual care, attention control). Primary outcomes of interest were pain reduction and/or improvement in physical function. Definitions of community-deliverable interventions and specific implementation guidelines along with operational definitions of pain and physical function were reported in the paper.

The included trials were conducted worldwide (two in UK). Most participants were women aged 50 and over and most had rheumatoid arthritis, osteoarthritis or fibromyalgia. Mean body mass index across the study groups was around 29kg/m². Mean times for symptom duration or time since diagnosis ranged from nine to 11 years. There was some evidence of concomitant medication use (including nonsteroidal anti-inflammatory drugs, analgesics, antidepressants, anxiolytics, muscle relaxants and pain medication). Where reported, exercise interventions were individual, group-based or a combination of both; they took place in facilities, at home or a combination of both. Intervention content varied in terms of mode, frequency and intensity. Pain and physical function were measured with a variety of self report, numerical rating and performance-based measures.

Two reviewers selected the studies for inclusion.

Assessment of study quality
Trial quality was assessed with the Cochrane risk of bias tool for sequence generation, allocation concealment, blinding, completeness of outcome data, selective reporting and other potential bias (specifically, an item on prior exercise involvement was included).

Two reviewers independently carried out the quality assessment. Disagreements were resolved by consensus.

Data extraction
Data were extracted or calculated on changes in pain and physical function to enable the presentation of effect sizes (g) along with standard deviations or 95% confidence intervals (CI). Probability values were extracted or calculated and statistical significance was determined. The number needed to treat was calculated. Study authors were contacted for further information, where necessary.
Data were extracted by two independent reviewers. Disagreements were resolved by consensus or through arbitration with a further two reviewers.

**Methods of synthesis**

Standardised effect sizes (adjusted for sample size) were presented and their magnitude was classified as trivial (<0.20), small (≥0.20 to <0.50), medium (≥0.50 to <0.80) or large (≥0.80). The minimally clinically important difference (MCID) was used to demonstrate the clinical relevance of the intervention and set at 10%. Random-effects meta-regression, method-of-moments and intercept models were used to pool the primary outcomes. Results were separated for each outcome and by intention-to-treat (ITT) or per-protocol analysis.

Statistical heterogeneity was assessed using the Q and $I^2$ statistics and was deemed substantial when $I^2$ was more than 50%. Publication bias was investigated using the Egger test. Sensitivity analysis was carried out by deleting each study in turn to explore their relative influence on overall results. Cumulative meta-analysis was conducted to explore temporal changes. Multiple regression analysis was carried out to explore covariate influence (such as type of rheumatic disease, type of exercise, presence of supervision, length of training and age).

**Results of the review**

Thirty-three studies (3,180 men and women, range 3 to 159) were included in the review. Results for quality assessment items were mixed: low risk of bias for sequence generation and incomplete outcome data and high risk of bias for blinding; more than half of studies reported that participants were sedentary at baseline. It was not possible to assess potential risks relating to allocation concealment and outcome reporting.

In pooled analysis, exercise groups were associated with a small statistically significant reduction in pain in ITT analysis (-0.20, 95% CI -0.33 to -0.07; 12 studies; $I^2$=65.4%; MCID -9%) and in per-protocol analysis (-0.37, 95% CI -0.53 to -0.21; 21 studies; $I^2$=33.1%; MCID -18%). The number needed to treat was nine (95% CI 5 to 25).

In ITT analysis exercise groups showed a small statistically significant improvement in physical function (0.34, 95% CI 0.25 to 0.43; 14 studies; $I^2$=19.1%; MCID 10%) and in per-protocol analysis (0.37, 95% CI 0.21 to 0.52; 17 studies; $I^2$=19.5%; MCID 15%). The number needed to treat was five (95% CI 4 to 7).

Results were unchanged in sensitivity and multiple regression analyses and when overall results were analysed at the study level. Cumulative meta-analysis showed that results had been statistically significant since 1997 for both outcomes. There was no evidence of publication bias.

**Authors’ conclusions**

Community-deliverable exercise improved pain and physical function in adults with the types of arthritis and other rheumatic diseases reported in this review.

**CRD commentary**

The review question was clear. Inclusion criteria were sufficiently detailed to enable replication. Various relevant sources of data were accessed. Steps were taken to maximise the yield of included studies while minimising potential for language and publication biases. The review process was conducted with adequate efforts to minimise error and bias. An appropriate quality assessment tool was applied and the results of this, together with other study details, were clearly presented. Study quality appeared to be mixed. The inherent difficulty of blinding in public health interventions was clearly stated. Statistical heterogeneity was high in one of the analyses and this reflected the observed clinical variation in terms of intervention content and outcome measurement. Appropriate analyses were conducted to explore potentially relevant influences on the results.

The authors’ conclusion seems reliable. Relevant research recommendations were offered.

**Implications of the review for practice and research**

**Practice:** The authors stated that positive intention to treat results demonstrated support for the investment of resources for community-based public health exercise programmes to improve pain and physical function in adults with arthritis and other rheumatic diseases.

**Research:** The authors highlighted issues for future research that included further testing of covariates, reliable...
assessments of initial and final activity levels (including those outside the intervention setting), inclusion of participants with less common types of arthritis and rheumatic disease and improved reporting of research, particularly in relation to the dose-response relationship between exercise and outcomes (further details were given in the paper).

**Funding**
Centers for Disease Control and Prevention, USA; Association of American Medical Colleges.

**Bibliographic details**

**PubMedID**
20824798

**DOI**
10.1002/acr.20347

**Original Paper URL**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; Arthritis; Arthritis, Rheumatoid /complications /physiopathology /therapy; Community Health Services /methods; Exercise /physiology; Exercise Therapy /methods; Female; Humans; Male; Pain /etiology /physiopathology; Pain Management; Randomized Controlled Trials as Topic /methods; Rheumatic Diseases /complications /physiopathology /therapy; Treatment Outcome

**AccessionNumber**
12011001218

**Date bibliographic record published**
30/03/2012

**Date abstract record published**
17/10/2012

**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.