The effectiveness of Tai Chi for chronic musculoskeletal pain conditions: a systematic review and meta-analysis

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CRD summary
The authors concluded that Tai Chi had a small positive effect at short-term follow-up on pain and disability in people with arthritis. However, available data was sparse and derived principally from low-quality trials. The authors' cautious conclusions appear appropriate, although the potential for publication and language bias, small sample sizes and variations between trials should be borne in mind.

Authors' objectives
To determine the effectiveness of Tai Chi for improving pain, disability, physical performance and health-related quality of life for people with chronic musculoskeletal pain conditions.

Searching
EMBASE, PEDro, AMED, MEDLINE, CINAHL, SPORTDiscus, LILACS, and the Cochrane Central Register of Controlled Trials (CENTRAL) were searched to June 2008. Search terms were reported. Only studies published in peer-reviewed journals were eligible. Non-English language studies were eligible providing an appropriate translation was available. Citation tracking of all included studies and identified review articles was undertaken to identify additional studies.

Study selection
Randomised controlled trials (RCTs) that evaluated Tai Chi exercise compared with placebo, usual care or minimal care for patients with a primary symptom of musculoskeletal pain were eligible for inclusion. Trials had to report at least one outcome measure of pain, self-reported disability, physical performance, or health-related quality of life.

Tai Chi interventions varied between included trials including Yang, Wu, and Sun styles. The frequency of the intervention ranged from one to three times a week, and duration ranged from six to 15 weeks. All the trials used a group intervention format and encouraged, but did not monitor daily home practice. The majority of participants had osteoarthritis in varying locations, the remaining trials were of participants with rheumatoid arthritis and tension headache. The mean age of participants ranged from 44 to 77 years. Outcomes were measured by a wide variety of tools including the Arthritis Impact Measurement Scale, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and various numerical rating scales (NRS).

Outcomes assessed included pain, disability, physical performance, and health-related quality of life in people with chronic musculoskeletal pain.

The authors did not state how many reviewers performed the selection.

Assessment of study quality
Validity was assessed using four items from the PEDro rating scale (maximum possible score of 10).

Two reviewers independently assessed validity.

Data extraction
Data on the change in scores together with standard deviations (SDs) at short-term follow-up (less than three months from randomisation) for all relevant outcomes were extracted and used to calculate mean differences and 95% confidence intervals (CI). Continuous outcomes were rescaled to a common 0 to 100 scale (higher score indicating more pain). Where change score data were not reported, trial authors were contacted. Where change scores were unobtainable, these were calculated using post-intervention scores if baseline scores were not significantly different.
between groups or if baseline scores were different between groups, estimating the change scores and standard deviations.

Two reviewers independently extracted data.

**Methods of synthesis**
Trials were grouped by condition (arthritis or tension headache) and combined using a random effect model to calculate pooled weighted mean differences (WMD). Heterogeneity was assessed using the $I^2$ statistic. Trials not included in the meta-analysis were reported separately.

**Results of the review**
Seven RCTs were included in the review (n=321 patients); sample sizes ranged from 16 to 97. One RCT scored 8 points for validity, two RCTs scored 5 points and the remaining RCTs scored 4 points or less.

Compared with control, Tai Chi significantly reduced self-reported pain for patients with arthritis (WMD 10.1 rating scale points, 95% CI 6.3 to 13.9; six RCTs) and tension headache (WMD 6.4 rating scale points, 95% CI 0.4 to 12.4; one RCT). Tai Chi significantly reduced self-reported disability for patients with arthritis (WMD 9.6 rating scale points, 95% CI 5.2 to 14.0; four RCTs) compared with control, but no difference was reported between groups for tension headache (one RCT). There was no evidence of statistical heterogeneity for these analyses.

There were no statistically significant differences between Tai Chi and control groups for the time taken to walk 50 feet, although there was evidence of significant statistical heterogeneity for these results ($I^2=55%$; two RCTs). Results from three RCTs on quality of life indicators were not able to be combined in a meta-analysis due to the use of multiple assessment tools, but these RCTs reported mixed effects.

Results on treatment adherence and implementation were also reported.

**Authors' conclusions**
The data suggested that Tai Chi had a small positive effect at short-term follow-up on pain and disability in people with arthritis. However, available data on this effect was sparse and derived principally from low-quality trials.

**CRD commentary**
The review question was clear and supported by appropriate inclusion criteria. Several relevant sources were searched, but the limitation of inclusion to only to peer-reviewed journals and the lack of specific searching of Chinese databases, meant there was the potential for publication bias. Some efforts were made to reduce language bias by including studies not in English if a translation was available. Appropriate methods were used to reduce reviewer error and bias for assessment of validity and extraction of data, but it is unclear whether similar steps were taken for selection of studies.

Validity was assessed using an appropriate tool and the results of the assessment were reported. Trials were combined in a meta-analysis; statistical heterogeneity was assessed. There were differences between trials in terms of style of Tai Chi, site and type of arthritis, and measurement of outcomes.

The authors' cautious conclusions appear appropriate, although the potential for publication and language bias, the small sample sizes and the variation between trials should be borne in mind.

**Implications of the review for practice and research**
**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that further high-quality studies with large samples sizes are required to further evaluate the effectiveness of Tai Chi, particularly in relation to other musculoskeletal conditions. Future studies should use reliable and valid outcome measures. A placebo-controlled trial is required to establish the specific effects of Tai Chi for improving chronic musculoskeletal pain conditions.
Funding
Australian Government scholarship funding; National Health and Medical Research Council (Australia) research fellowship; University of Sydney post-doctoral fellowship.

Bibliographic details

PubMedID
19479696

DOI
10.1002/art.24515

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Chronic Disease; Disability Evaluation; Exercise Therapy /methods; Health Status Indicators; Humans; Musculoskeletal Diseases /complications /physiopathology /therapy; Pain /etiology /physiopathology; Pain Management; Quality of Life; Randomized Controlled Trials as Topic; Tai Ji /methods; Treatment Outcome

AccessionNumber
12009106715

Date bibliographic record published
16/12/2009

Date abstract record published
22/09/2010

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.