Tai chi for osteoporosis: a systematic review
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CRD summary
The review concluded there was no convincing evidence for the effectiveness of tai chi for the prevention or treatment of osteoporosis. Further rigorous research was required. Given the small number of included studies, their small sample sizes and poor methodological rigor, the authors’ cautious conclusions appear appropriate.

Authors’ objectives
To evaluate the effectiveness of tai chi for the treatment or prevention of osteoporosis.

Searching
MEDLINE, AMED, British Nursing Index, CINAHL, EMBASE, PsycINFO, ClinicalTrials.gov, The Cochrane Library, Korean medical databases (details provided), Qigong and Energy Medicine database and Chinese databases (details reported) were searched from inception to March 2007. Search terms were reported. Handsearching of relevant journals and authors' files was conducted. Experts in the field were contacted for additional studies. Reference lists of located articles and proceedings of the International Conference of Tai Chi for Health (2006) were scanned for relevant data. No language restrictions were applied.

Study selection
Prospective controlled trials evaluating tai chi for the prevention or treatment of osteoporosis were eligible for inclusion. Abstracts and dissertations were also eligible for inclusion. There were no restrictions on participant characteristics. Studies that assessed outcome measures that compared percentage changes in bone parameters (presented as bone mineral content or density, bone mass, bone metabolism) between intervention and control groups were eligible for inclusion.

In the included studies tai chi was compared with sedentary lifestyle, exercise, calcium supplements, resistance training or no treatment. The number of tai chi sessions ranged from approximately 32 to approximately 280. The number of supervised interventions ranged from two to seven sessions weekly. Duration ranged from 40 to 60 minutes per session. Participants in the included studies were menopausal women and men and women aged over 65 years.

Two reviewers independently screened studies for inclusion. Disagreements were resolved by discussion or by recourse to a third reviewer.

Assessment of study quality
Validity was assessed using the Jadad score to assess randomisation, blinding and withdrawals (maximum score of 5). One point was assigned if the outcome assessor was blinded. Two reviewers independently assessed validity. Disagreements were resolved by discussion or by recourse to a third reviewer.

Data extraction
Data on bone mineral density was extracted for individual studies using a standardised form. Mean change was compared to baseline for intervention and control groups. Two reviewers independently extracted data. Disagreements were resolved by discussion or by recourse to a third reviewer.

Methods of synthesis
Weighted mean differences and 95% confidence intervals were calculated for homogenous studies using a random-effects model. The remaining studies were described in the text and additional data presented in tables. Heterogeneity was assessed using the X² test and the I² test.

Results of the review
Seven trials (n=561) comprising five randomised controlled trials (RCTs, n=464) and two controlled clinical trials
(n=97) were included. The methodological quality was low for three RCTs and one controlled clinical trial that assessed postmenopausal women. None of these trials reported details of randomisation, blinding or allocation concealment. Only one trial sufficiently described details of dropouts and withdrawals. Methodological quality was moderate for two RCTs and one controlled clinical trial that assessed elderly subjects. Two trials described methods of randomisation. One trial reported blinding of assessor together with allocation concealment. Two RCTs reported sufficient details of withdrawals and drop-outs.

Postmenopausal women:

Meta-analysis of studies that evaluated the effect of tai chi on bone mineral density change at the spine in comparison with no treatment found no statistically significant effects (weighted mean difference 0.02, 95% confidence interval: -0.02 to 0.06, p=0.31; three RCTs). There was no evidence of statistical heterogeneity.

One RCT (n=132) found that tai chi was superior to control for loss of bone mineral density compared to a sedentary lifestyle. Two RCTs (n=21 and 22) found no differences between tai chi and exercise or calcium supplements for bone mineral density. One controlled clinical trial (n=4) found significant effects of tai chi on serum osteocalcin, pyridinoline and deoxypyridinoline compared to baseline (data not reported).

Elderly participants aged over 65 years:

There were no statistically significant differences for one RCT (n=180) that compared tai chi with resistance training and no treatment for total hip bone mineral density in women and in men. There was no evidence of differences between groups for total bone mineral density of the spine in both genders. One RCT (n=28) found statistically significant differences in favour of tai chi in comparison with resistance training on bone metabolism for alkaline phosphatase at six weeks (p<0.05) and parathyroid hormone concentration at 12 weeks (p<0.05). One controlled clinical trial (n=57) reported that tai chi significantly improved total bone mineral density (site not reported, p<0.05) and reduced fracture rate (p<0.01) in institutionalised elderly participants.

Authors’ conclusions
No convincing evidence was found for the effectiveness of tai chi for the prevention or treatment of osteoporosis. Further rigorous research was required.

CRD commentary
Inclusion criteria were clearly defined in terms of intervention, participants, outcomes and study design. Several relevant sources were searched with no language restrictions and efforts were made to reduce publication bias. Two reviewers independently selected studies, assessed validity and extracted data, thus reducing the potential for reviewer bias and errors. Validity was assessed using specified criteria and results of the assessment were reported. Statistical heterogeneity was assessed and, appropriately, only homogenous studies were combined in a meta analysis. Other studies were discussed in the text. Given the small number of included studies, their small sample sizes and poor methodological rigor, the authors’ cautious conclusions appear appropriate.

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

Research: The authors stated that RCTs that evaluated tai chi for treatment or prevention of osteoporosis were needed and should adhere to accepted standards of trial methodology. Future trials should include larger sample sizes, use longer treatment periods and assess relevant outcomes such as balance, falls and fall-related fractures.

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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.