



Systematic reviews of t'ai chi: an overview

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ABSTRACT

Several systematic reviews (SRs) have assessed the effectiveness of t'ai chi for many conditions including hypertension, osteoarthritis and fall prevention; however, their conclusions have been contradictory. The aim of this overview was to critically evaluate the SRs of t'ai chi for any improvement of medical conditions or clinical symptoms. English, Chinese and Korean electronic databases were searched for relevant articles, and data were extracted according to predefined criteria; 35 SRs met our inclusion criteria. They were related to the following conditions: cancer, older people, Parkinson's disease, musculoskeletal pain, osteoarthritis, rheumatoid arthritis (RA), muscle strength and flexibility, improving aerobic capacity, cardiovascular disease and risk factors, lowering resting blood pressure, osteoporosis or bone mineral density, type 2 diabetes, psychological health, fall prevention and improving balance, and any chronic conditions. In several instances, the conclusions of these articles were contradictory. Relatively clear evidence emerged to suggest that t'ai chi is effective for fall prevention and improving psychological health and was associated with general health benefits for older people. However, t'ai chi seems to be ineffective for the symptomatic treatment of cancer and RA. In conclusion, many SRs of t'ai chi have recently been published; however, the evidence is convincingly positive only for fall prevention and for improvement of psychological health.

INTRODUCTION

T'ai chi combines deep breathing and relaxation with slow and gentle movements.¹ It is based on an assumption from Confucian and Buddhist philosophy that states that two opposing life forces, yin and yang, govern our health.¹ Ill health is viewed as an imbalance between yin and yang, and t'ai chi can reportedly rebalance such energy disturbances. Regardless of these assumptions, the slow movements between different postures that are normally held for short periods of time represent physical stimuli, which affect the cardiovascular and muscular systems.¹

It has been reported that t'ai chi has beneficial effects in reducing high blood pressure, improving balance and muscle strength, and preventing falls.² T'ai chi is supported by several associations, including the Arthritis Foundation of Australia, Diabetes Australia, and the National Parkinson Foundation in the USA, and 2 500 000 individuals reportedly use it regularly for health reasons.³ However, the clinical effectiveness of t'ai chi remains uncertain.¹ Many clinical trials have emerged, but their results are contradictory. Systematic reviews that assess all of this evidence arrive at similarly contradictory conclusions.

This overview is aimed at summarising and critically evaluating all SRs that involve t'ai chi as a treatment for any health condition. Our ultimate goal is to provide clinicians with clearer guidance on the value of this approach.

METHODS

Electronic literature searches were carried out in July 2010 using Medline, Embase, Amed, CINAHL, the Cochrane Library, six Korean Medical Databases (Korean Studies Information, DBPIA, Korea Institute of Science and Technology Information, KERIS, KoreaMed, and Korean National Assembly Library) and Chinese Database (CNKI) without restrictions on the study date or language. The search terms were the MESH terms of 't'ai chi' AND 'systematic review' OR 'meta-analysis.' In addition, our departmental files were hand-searched. Abstracts of reviews located using this search were inspected by two authors, and those appearing to meet the inclusion criteria were retrieved and read in full by all of the authors of the current review. The reviews were defined as systematic if they included explicit inclusion/exclusion criteria as well as an explicit and repeatable methods section that described the search strategy.

To be included, a systematic review had to specifically address the effectiveness of t'ai chi and include evidence from at least two controlled clinical trials. Systematic reviews that evaluated t'ai chi in combination with other types of treatment without separately evaluating the individual approaches were excluded.

The assessments of the quality of the primary studies were adopted from the respective SRs. The Overview Quality Assessment Questionnaire (OQAQ) was used to evaluate the methodological quality of all of the included SRs.⁴ The OQAQ score ranges from 1 to 7; a score of 3 or less indicated extensive or major flaws, and a score of 5 or more suggested minor or minimal flaws. The two authors independently assessed the OQAQ and extracted the data using predefined criteria (table 1), and discrepancies were settled by discussion.

RESULTS

Our searches generated 55 hits, and 35 SRs met our inclusion criteria (figure 1, table 1),⁵⁻³⁹ which had been published between 2002 and 2010. The first authors originated from the USA (n=10), the UK (n=9), Korea (n=6), France (n=2), Australia (n=2), Netherlands (n=2), Canada (n=1), New Zealand (n=1), Singapore (n=1) and Sweden (n=1). Ten reviews incorporated a meta-analytic approach.^{5 11 14 17 18 20 21 24 27 32} The reviews were based on two to 47 primary studies.

Table 1 Systematic reviews of tai chi used for the treatment of health conditions

Author (year)(reference)	Condition/population	No of randomised controlled trials	Quality of randomised controlled trials	Meta-analysist	Conclusion (quote)	Quality of systematic review OOAQ*	Result	Country
Lee <i>et al</i> (2010) ⁵	Breast cancer	3	Poor	Quality of life: SMD, 0.45 (0.25, 1.14)	.. the existing trial evidence does not show convincingly..	7	-	Korea
Lee <i>et al</i> (2007) ⁶	Cancer	3	Poor	No	The evidence is not convincing..	5	-	UK
Rogers <i>et al</i> (2009) ⁷	Older adults	36	Variable	No	.. Tai chi .. may help older adults ..	1	+	USA
Lee <i>et al</i> (2008) ⁸	Older adults	29	Variable	No	Tai chi exercise appears to have physical and psychosocial benefits ..	1	+	Korea
Verhagen <i>et al</i> (2004) ⁹	Older adults	9	Variable	No	There is limited evidence	7	±	Netherlands
Lee <i>et al</i> (2008) ¹⁰	Parkinson's disease	3	Poor	No	The evidence is insufficient..	5	±	UK
Hall <i>et al</i> (2009) ¹¹	Musculoskeletal pain	7	Variable	Pain reduction: WMD, 10.12 (13.92, 0.63)	.. Tai chi has a small positive effect ..	7	+	Australia
Lee <i>et al</i> (2008) ¹²	Osteoarthritis	5	Good	No	.. there is some encouraging evidence ..	5	+	UK
Lee <i>et al</i> (2007) ¹³	Rheumatoid arthritis	2	Poor	No	.. evidence is not convincing ..	7	-	UK
Han <i>et al</i> (2004) ¹⁴	Rheumatoid arthritis	3	Poor	Yes (meta-analysis with CCTs—not meaningful)	Tai chi does not exacerbate ..	7	-	Canada
Bims and Taylor (2008) ¹⁵	Multiple sclerosis	0	Poor	No	Key findings include improve in ..	1	+	New Zealand
Choi <i>et al</i> (2005) ¹⁶	Muscle strength and flexibility	3	Poor	No	75% of papers were significantly improvement in ..	1	+	Korea
Lee <i>et al</i> (2009) ¹⁷	Improvement of aerobic capacity	5	Good	WMD, 0.50 (1.1, 2.15)	.. the existing evidence does not suggest ..	7	-	Korea
Taylor-Piliae (2008) ¹⁸	Improving aerobic capacity	4	Good	ES=0.38 (0.10, 0.85)	Tai chi is effective in ..	3	+	USA
Yeh <i>et al</i> (2009) ¹⁹	Cardiovascular disease and risk factors	9	Variable	No	Tai chi exercise may be a beneficial adjunctive therapy ..	4	+	USA
Lee <i>et al</i> (2007) ²⁰	Cardiovascular disease and risk factors	9	Variable	SBP: WMD, 21.5 (25.8, 17.1) DBP: WMD, 12.1 (15.3, 8.8)	Tai chi for CV and its risk factors is scarce	5	-	UK
Lee <i>et al</i> (2010) ²¹	Lowering resting blood pressure in older people	4	Variable	SBP: WMD, 2.5 (5.90, 0.90) DBP: WMD 1.49 (3.50, 0.52)	The evidence.. is limited	7	±	Korea
Yeh <i>et al</i> (2008) ²²	Reducing of blood pressure	9	Variable	No	Tai chi exercise may reduce BP ..	4	+	USA
Eun <i>et al</i> (2005) ²³	Reducing blood pressure and improving cardiopulmonary function	7	Good	No	Tai chi exercise over 16 weeks improves ..	2	+	Korea
Lee <i>et al</i> (2008) ²⁴	Osteoporosis	5	Variable	Bone mineral density: WMD 0.02 (0.02, 0.06)	The evidence .. is not convincing	7	-	UK
Wayne <i>et al</i> (2007) ²⁵	Bone-mineral density	2	Variable	No	.. limited evidence ..	4	±	USA
Lee <i>et al</i> (2008) ²⁶	Type 2 diabetes	2	Good	No	.. evidence .. is scarce and not convincing	4	-	UK
Wang <i>et al</i> (2010) ²⁷	Psychological well-being	17	Variable	Stress reduction: ES 0.66 (0.23, 1.09) anxiety: ES 0.66 (0.29, 1.03) depression: ES 0.56 (0.31, 0.80) mood: ES 0.45 (0.20, 0.69)	Tai chi appears to be associated with improvements in ..	6	+	USA

Continued

Table 1 Continued

Author (year)(reference)	Condition/population	No of randomised controlled trials	Quality of randomised controlled trials	Meta-analysis†	Conclusion (quote)	Quality of systematic review OOAQ*	Result	Country
Berghmans <i>et al</i> (2009) ²⁸	Improving mental and physical health	47	Variable	No	Our study has demonstrated a real potential exists ..	1	+	France
Wang <i>et al</i> (2009) ²⁹	Improving psychological well-being	15	Variable	No	It is still premature to make any conclusive remarks ..	2	±	Australia
Dechamps <i>et al</i> (2007) ³⁰	Self-efficacy and psychological health	8	Variable	No	T'ai chi benefits appeared to be more tangible ..	4	+	France
Sandlund and Norlander (2000) ³¹	Stress response and well-being	3	Variable	No	T'ai chi exercise may lead to improvement in mood	1	+	Sweden
Logghe <i>et al</i> (2010) ³²	Fall prevention, fear of falling and balance	9	Variable	Compared with exercise - fall rates: RR 0.51(0.38, 0.68) Compared with non-exercise - fall rates: RR 0.79 (0.60, 1.03);	Currently there is insufficient evidence ..	7	±	Netherlands
Low <i>et al</i> (2009) ³³	Fall reduction	7	Variable	No	T'ai chi has the potential ..	4	+	Singapore
Gregory and Watson (2009) ³⁴	Fall prevention	6	Variable	No	T'ai chi .. may be beneficial ..	5	+	UK
Harling and Simpson (2008) ³⁵	Reducing falls and fear of falling	7	Variable	No	There is strong ..	6	+	UK
Komagata and Newton (2003) ³⁶	Improving balance	11	Variable	No	T'ai chi is effective ..	5	+	USA
Wu (2002) ³⁷	Improving balance and preventing fall	6	Poor	No	.. only scattered evidence ...	1	±	USA
Wang <i>et al</i> (2004) ³⁸	Any chronic condition	9	Mostly poor	No	T'ai chi appears to be .. effective ..	2	+	USA
Klein and Adams (2004) ³⁹	Any	12	Good	No	Controlled research evidence was found to confirm therapeutic benefits ..	4	+	USA

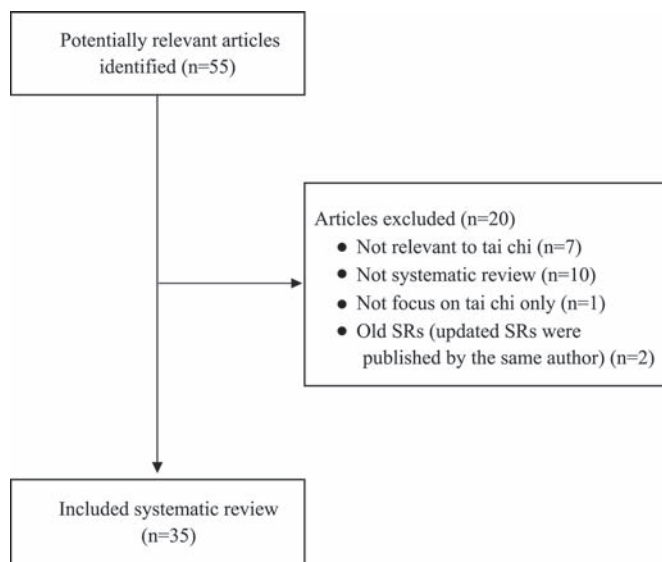
*OOAQ, Overview Quality Assessment Questionnaire. The overall score ranges from 1 to 7. OOAQ ≤ 3, extensive or major flaws; OOAQ ≤ 5, minor or minimal flaws; +, overall positive; -, overall negative; ±, unclear. DBP, diastolic blood pressure; ES, effect size; RR, relative risk; SBP, systolic blood pressure; SMD, standard mean difference; WMD, weight mean difference.

†, the values are expressed as SMD, WMD, or RR and (95% confidence intervals).

Table 2 Indications evaluated by multiple systematic reviews (SRs)

Condition	No of SRs	Direction of results			Overall effects	Comments
		+	±	-		
Breast cancer	2	0	0	2	-	Both SRs are of high quality
Old age	3	2	1	0	+	Positive SR is of poor quality
Rheumatoid arthritis	2	0	0	2	-	Cochrane review is negative
Improving aerobic capacity	2	1	0	1	±	Positive SR is of poor quality
Cardiovascular disease and risk factors	2	1	0	1	±	Contradiction exists in interpretation
Lowering blood pressure	3	2	1	0	±	Positive SRs are of poor quality
Osteoporosis or bone mineral density	2	0	1	1	±	Positive SR included more trials that originate from China
Psychological health	5	5	1	0	+	Methodological quality is variable
Fall prevention	4	3	1	0	+	All of the included SRs are of high quality
Improving balance	2	1	1	0	+	Newer SR is more positive

+, positive conclusion; ±, conclusion neither positive nor negative; -, negative conclusion.

**Figure 1** Flow chart of the publication-selection process. SR, systematic review.

The SRs covered a wide range of conditions and situations, including the following: cancer, general healthcare in older people, Parkinson's disease, musculoskeletal pain, osteoarthritis, rheumatoid arthritis (RA), muscle strength and flexibility, improving aerobic capacity, cardiovascular disease and risk factors, lowering resting blood pressure, osteoporosis or bone mineral density, type 2 diabetes, psychological health, fall prevention and improving balance, as well as any chronic conditions. Based on the OQAQ scores, the quality of the SRs varied; 17 SRs had minimal bias,^{5 6 9-14 17 20 21 24 27 32 34-36} 11 had major flaws,^{7 8 15 16 18 23 28 29 31 37 38} and the remaining seven SRs had moderate flaws.^{19 22 25 26 30 33 39}

Seven SRs concluded that the current data were insufficient to draw firm conclusions,^{8 10 21 25 29 32 37} eight SRs concluded that t'ai chi did not have a beneficial effect,^{5 6 13 14 17 20 24 26} and 20 SRs concluded that t'ai chi might be effective.^{7 8 11 12 15 16 18 19 22 23 27 28 30 31 33-36 38 39} Of the nine high-quality SRs,^{5 9 11 13 14 17 21 24 32} one arrived at a positive conclusion,¹¹ five arrived at a negative conclusion,^{5 13 14 17 24} and in three SRs,^{9 21 32} no clear conclusions were drawn.

A relatively clear consensus existed that t'ai chi was effective for improving the general health of older people, improving psychological health, and for preventing falls (table 2). Of the four

SRs that evaluated fall prevention,³²⁻³⁵ three showed clearly positive effects of t'ai chi,³³⁻³⁵ whereas one cast doubt on the effectiveness of t'ai chi.³² In terms of improving psychological health, four SRs drew positive conclusions,^{27 28 30 31} whereas one was inconclusive.²⁹ All three SRs that evaluated healthcare in older people drew equivocal positive conclusions.⁷⁻⁹ For the symptomatic treatment of RA^{13 14} and cancer,^{5 6} the evidence appeared to be clearly negative based on the two SRs that drew negative conclusions, respectively. Clear contradictions emerged in terms of improving aerobic capacity,^{17 18} improving cardiovascular disease and its risk factors,^{19 20} and improving balance;^{36 37} one positive SR and one negative SR were found for each of those indications. However, positive SRs were of poor quality and included flaws for several indications including general healthcare of older people, improving aerobic capacity and lowering blood pressure. Furthermore, positive SRs included more trials from China or no randomised controlled trials (RCTs). Hence, caution should be exercised in interpreting the evidence for these conditions.

DISCUSSION

Our analysis showed that 35 SRs of t'ai chi used in the treatment of various health conditions have been recently published, which indicates that the interest in this subject has grown considerably; however, the conclusions of the SRs are not consistent. The evidence for fall prevention, healthcare for older people, improving psychological health, cancer and RA is relatively clear (table 2). However, contradictions emerge when examining the effects on improving aerobic capacity and improving cardiovascular disease and its risk factors. In terms of improving aerobic capacity, these contradictions can be explained by the time difference between the two SRs.^{17 18} The more recent SR included a more rigorous study with negative results that had been conducted since the publication of the earlier SR.¹⁷ Thus, overall, the current best evidence seems to suggest that t'ai chi is not effective for this indication. In terms of cardiovascular disease and risk factors, the results might be more complex.^{19 20} The two SRs included the same RCTs, but the conclusions were different. One of the SRs drew an equivocal conclusion,²⁰ whereas the other drew a positive conclusion.¹⁹ Thus, the current best evidence is not clearly positive.

The SRs related to Parkinson's disease¹⁰ and type 2 diabetes²⁶ were based on relatively small numbers of primary studies. Thus, their conclusions may be less reliable. This indicates that more high-quality studies are required for the evaluation of these indications.

What is already known on this topic

T'ai chi, is a form of complementary therapy, and has been used in the treatment of various conditions and has been reported as beneficial for reducing blood pressure and knee pain, improving balance and muscle strength, and improving fall prevention.

What this study adds

Numerous systematic reviews, often with contradictory conclusions, exist but only for two conditions (fall prevention and psychological health improvement) is the evidence convincingly positive.

Our overview showed that t'ai chi, which combines deep breathing and relaxation with slow and gentle movements, may exert exercise-based general benefits for fall prevention and improvement of balance in older people as well as some meditative effects for improving psychological health. We recommend t'ai chi for older people for its various physical and psychological benefits. However, t'ai chi may not effectively treat inflammatory diseases and cardiorespiratory disorders.

Most of the SRs were of high quality, but many primary studies evaluated in these SRs were associated with a high risk of bias. Common study weaknesses included small sample sizes and lack of an adequate control group. This means that the SRs draw conclusions that are often not definite or final.

Our overview has several limitations. Our literature searches of the English, Chinese and Korean databases were extensive, but we cannot be absolutely sure that all relevant articles were located. Our overview was aimed at evaluating the SRs rather than the individual primary studies, which means there is a risk of diluting the results of high-quality studies by including low-quality data.

Future research on t'ai chi should be conducted more rigorously. We recommend that researchers follow the CONSORT guidelines when designing and reporting clinical trials.⁴⁰ Our overview of SRs complied with the PRISMA guidelines, and we recommend that future SRs do so as well to produce high-quality systemic reviews.⁴¹

In conclusion, several SRs of t'ai chi used in the treatment of a wide range of conditions have recently been published. They suggest that the evidence is conclusively or tentatively positive for fall prevention, general healthcare in older people, improving balance and enhancing psychological health. For cancer, aerobic capacity and RA, the evidence from SRs was not conclusively positive.

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