

Health benefits of tai chi

What is the evidence?

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Abstract

Objective To summarize the evidence on the health benefits of tai chi.

Sources of information A literature review was conducted on the benefits of tai chi for 25 specific conditions, as well as for general health and fitness, to update a 2014 review of systematic reviews. Systematic reviews and recent clinical trials were assessed and organized into 5 different groups: evidence of benefit as excellent, good, fair, or preliminary, or evidence of no direct benefit.

Main message During the past 45 years more than 500 trials and 120 systematic reviews have been published on the health benefits of tai chi. Systematic reviews of tai chi for specific conditions indicate excellent evidence of benefit for preventing falls, osteoarthritis, Parkinson disease, rehabilitation for chronic obstructive pulmonary disease, and improving cognitive capacity in older adults. There is good evidence of benefit for depression, cardiac and stroke rehabilitation, and dementia. There is fair evidence of benefit for improving quality of life for cancer patients, fibromyalgia, hypertension, and osteoporosis. Current evidence indicates no direct benefit for diabetes, rheumatoid arthritis, or chronic heart failure. Systematic reviews of general health and fitness benefits show excellent evidence of benefit for improving balance and aerobic capacity in those with poor fitness. There is good evidence for increased strength in the lower limbs. There is fair evidence for increased well-being and improved sleep. There were no studies

that found tai chi worsened a condition. A recent systematic review on the safety of tai chi found adverse events were typically minor and primarily musculoskeletal; no intervention-related serious adverse events have been reported.

EDITOR'S KEY POINTS

- Tai chi is a meditative martial art that consists of a series of gentle movements designed to strengthen and relax the body and mind. Increasingly, its therapeutic effects have come under study. This review aims to summarize the evidence on the therapeutic and fitness benefits of tai chi so that clinicians can offer evidence-based recommendations to their patients.

- More than 500 studies and 120 systematic reviews have been published. The strongest evidence of benefit is for preventing falls in older adults living in the community, osteoarthritis, Parkinson disease, chronic obstructive pulmonary disease rehabilitation, improving cognitive capacity, and improving balance and aerobic capacity.



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Conclusion There is abundant evidence on the health and fitness effects of tai chi. Based on this, physicians can now offer evidence-based recommendations to their patients, noting that tai chi is still an area of active research, and patients should continue to receive medical follow-up for any clinical conditions.

Tai chi is a meditative martial art that has been practised in China for centuries and that has become increasingly popular in the West.¹ It consists of a series of gentle movements that strengthen and relax the body and mind.² There are different schools of tai chi, yet all share key features such as mindfulness, structural alignment, and flexibility (**Table 1**).³ New forms of tai chi continue to evolve, including shortened protocols for the elderly. Some forms, such as Taoist tai chi, have a specific health recovery focus.⁴

With tai chi becoming increasingly popular, patients might ask physicians whether it could be beneficial for them. The objective of this review was to summarize the evidence on the therapeutic benefits of tai chi so that clinicians can offer evidence-based recommendations to their patients.

Case description

B.G., a 48-year-old woman, comes into your office for follow-up of borderline hypertension and a slightly elevated fasting blood glucose level. She has worked all her adult life and recently

the last of her 3 grown children has left home. When you ask how things are going, she says she is OK but feels burned out. She has neglected herself, gets no regular exercise, has gained some weight, and feels depressed about her “empty nest syndrome.” She asks about tai chi, noting that her mother swears by it. Her mother says she sleeps better, that her osteoarthritis has improved, and that she is now more socially active than ever. On examination, B.G.’s blood

pressure is 140/85 mm Hg, her body mass index is 29 kg/m², and screening reveals a positive score for depression. What should you do? What are your recommendations regarding tai chi?

Sources of information

We reviewed the 2014 *Evidence Map of Tai Chi*, which is a “systematic review of systematic reviews” conducted by the Evidence-based Synthesis Program Centre for the US Department of Veterans Affairs.¹ We then conducted a MEDLINE review of systematic reviews and randomized controlled trials (RCTs) published after the evidence map up to October 2015. We assessed the evidence for specific conditions, as well as evidence for general health and fitness benefits, and then classified it into 1 of 5 categories: evidence of benefit was *excellent* if there were many systematic reviews noting consistent evidence of benefit, *good* if there were several systematic reviews that generally showed benefit, *fair* if there were a few systematic reviews that overall showed benefit but that might have included mixed results, and *preliminary* if there were only a few trials or 1 or 2 systematic reviews; *evidence of no direct benefit* was based on systematic reviews that showed no direct benefit for the condition under study (even if a general health benefit might have been documented).

Main message

Research on tai chi has exploded in the past 45 years. A bibliometric analysis of clinical studies published between 1958 and 2013 found more than 500 studies on tai chi from 21 countries,⁵ mostly supported by government funding. The number of articles published on tai chi in PubMed journals has been increasing exponentially (Figure 1). In 2015 there were, on average, 15 articles published *each month*.

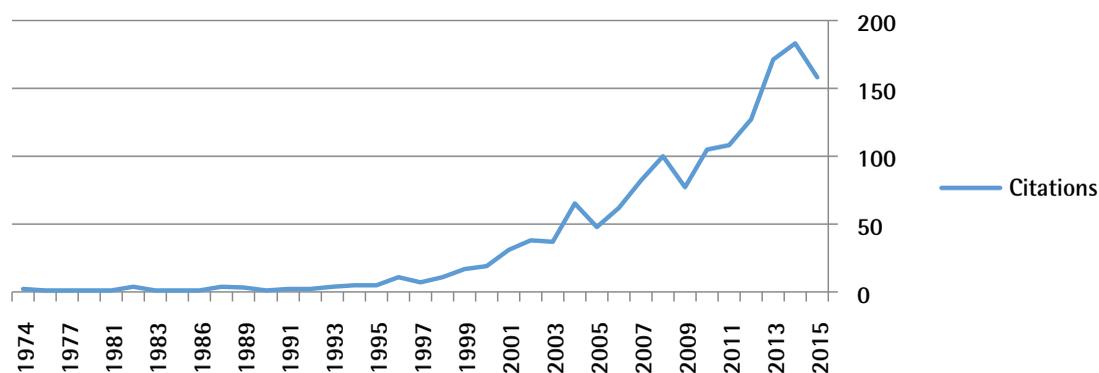
Evidence was reviewed for general health and fitness and 25 different conditions and then organized

Table 1. Key features of tai chi

FEATURE	DESCRIPTION
Mindfulness	Awareness of the current moment is cultivated during tai chi by focusing on the body’s position, movements, and sensations
Imagery	Images are used as a learning strategy (eg, one of the moves is called <i>wave hands like clouds</i>)
Structural alignment	Movements are biomechanically efficient, calling for the least amount of effort
Flexibility and relaxation	Circular and flowing motions provide dynamic stretching and help to shift the body and mind into a state of deeper relaxation
Strength and balance	Placing weight on one foot at a time in a slightly flexed position leads to greater strength in the lower extremities and improved balance
Natural breathing	Rhythmic breathing with movement appears to improve gas exchange and promote calmness
Social support	Positive interactions within a community give a sense of belonging and support
Integration of body, mind, and spirit	Tai chi creates a practical framework for living a more holistic life

Adapted from Wayne.³

Figure 1. PubMed tai chi article citations by year: January 1974 to October 2015.



according to the quality of evidence for benefit: excellent, good, fair, preliminary, or evidence of no direct benefit.

Excellent evidence of benefit. There are 5 conditions that had many systematic reviews showing consistent evidence of benefit for tai chi: preventing falls in older adults in the community, osteoarthritis, Parkinson disease, chronic obstructive pulmonary disease (COPD), and cognitive functioning.

Fall prevention in the community: There were 14 systematic reviews summarizing trials on fall prevention in older adults living in the community.⁶⁻¹⁹ Some looked at multiple interventions including tai chi,⁶⁻¹⁴ and others looked specifically at tai chi.¹⁵⁻¹⁹ Reviews consistently found a decreased risk of falls in the tai chi groups, typically associated with improvements in static and dynamic balance. One review identified tai chi as the most cost-effective intervention to prevent falls.¹² In addition, 4 systematic reviews identified that tai chi decreased the fear of falling.^{15,19-21} Tai chi was not found to be as beneficial for those needing assisted living, such as visually impaired adults in residential care.²² This is consistent with a Cochrane review that found most interventions, including all exercise programs, were not effective in preventing falls in frail, institutionalized elderly patients,²³ and with a recent trial that did not show benefit in preclinically disabled adults.²⁴

Osteoarthritis: There were 10 systematic reviews on osteoarthritis and all found that exercise, including tai chi, was associated with improvements, especially for osteoarthritis of the knee.²⁵⁻³⁴ One meta-analysis of trials on tai chi for osteoarthritis found statistically significant improvements in pain ($P = .0005$), stiffness ($P = .04$), and physical function ($P < .00001$).²⁹ Recent trials have confirmed these findings^{35,36} and another trial is under way.³⁷ Tai chi is now a conditional recommendation of the American College of Rheumatology for osteoarthritis of the hand, hip, and knee.³⁸

Parkinson disease: There were 8 systematic reviews on tai chi and Parkinson disease.³⁹⁻⁴⁶ The key finding was that people with Parkinson disease who took medication and did tai chi had better mobility and balance outcomes compared with those who took medication alone. Since a study published in the *New England Journal of Medicine*,⁴⁷ there has been an increase in clinical trials,⁴⁸⁻⁵² including a study showing tai chi to be cost-effective.⁵² An RCT is under way.⁵³

Chronic obstructive pulmonary disease: There were 6 systematic reviews on tai chi for asthma and COPD that found improvements in 6-minute walk test results, dyspnea, and forced expiratory volume in 1 second.⁵⁴⁻⁵⁹ More definitive trials are now under way.^{60,61}

Cognitive functioning: Five systematic reviews found that tai chi improved cognitive performance.⁶²⁻⁶⁶ A

meta-analysis found improved attention ($P < .001$) and processing speed ($P < .001$) in the tai chi group compared with controls.⁶⁴ There was a moderate effect size even compared with active controls.⁶⁵ These findings were confirmed in recent randomized trials.^{67,68}

Good evidence of benefit. There are 4 conditions that had several systematic reviews that generally showed benefit: depression, cardiac rehabilitation, stroke rehabilitation, and dementia.

Depression: There were 8 systematic reviews on tai chi and depression.⁶⁹⁻⁷⁶ Although many trials had small numbers and most were short term, the findings were consistently positive. More recently, a longer trial of 24 weeks with more than 200 participants with obesity and depression showed that the tai chi group had reduced severity of depression ($P < .001$).⁷⁷

Cardiac and stroke rehabilitation: There were 6 systematic reviews on tai chi for cardiac rehabilitation.⁷⁸⁻⁸³ Although the initial trials were small, there was a consistent finding of benefit. Tai chi might be particularly helpful for women with coronary artery disease^{84,85} and the elderly.⁸⁶ Recent trials found increased functional capacity after myocardial infarction⁸⁷ and that tai chi was an effective alternative for those who could not attend formal rehabilitation.⁸⁸

There were 5 systematic reviews on tai chi for stroke rehabilitation⁸⁹⁻⁹³; all had positive findings but trial sizes were small. Studies that have been done since the last systematic review have found a consistent benefit^{94,95} and additional trials are planned.^{96,97}

Cognitive impairment and dementia: There were 2 systematic reviews on tai chi for the treatment of cognitive impairment and dementia that showed improvements in Mini-Mental State Examination scores.^{65,98} The Cochrane review of exercise programs for people with dementia concluded that tai chi was better than physical activity for improving executive function.⁹⁸ This is consistent with the evidence for improving cognitive capacity in older adults.⁶²⁻⁶⁶ However, achieving this benefit might take time; one recent short-term study of tai chi in those with mild cognitive impairment did not find an improvement.⁹⁹

Fair evidence of benefit. There are 4 conditions that had a few systematic reviews indicating that overall tai chi was effective, but some of the included trials did not show benefit: quality of life for cancer patients, fibromyalgia, hypertension, and osteoporosis.

Quality of life for cancer patients: There were 7 systematic reviews on quality of life for cancer patients, most of which were among those with breast cancer.¹⁰⁰⁻¹⁰⁶ Although results were mixed, in part owing to different outcomes measures, overall there was a positive pooled effect for vitality and mental health

similar to that found with regular exercise. A recent trial showed improved health-related quality of life and biomarkers in breast cancer survivors who did tai chi.¹⁰⁷

Fibromyalgia: There were 4 systematic reviews on fibromyalgia.¹⁰⁸⁻¹¹¹ There were different outcomes measured and different trial lengths; some trials did not show benefit. A *New England Journal of Medicine* study showed a positive effect, but the sample size was small.¹¹² Overall the reviews indicated that people with fibromyalgia who did tai chi reported less pain and had improved function. These benefits were confirmed in recent clinical trials.^{113,114} Trial length might explain some of the initial variability. A 6-month trial showed that a decrease in chronic pain appeared only after 4 to 6 months.¹¹³ A 1-year head-to-head trial of aerobic exercise versus tai chi for fibromyalgia is under way.¹¹⁵ In the meantime, some European countries have started to include tai chi in their fibromyalgia treatment guidelines.¹¹⁶

Hypertension: There were 4 systematic reviews on hypertension that found tai chi lowered both systolic and diastolic blood pressure; however, this finding was based on trials that had some methodologic weaknesses, and trial sizes were generally small.¹¹⁷⁻¹²⁰ A recent larger trial published in the *American Journal of Cardiology* found that tai chi reduced blood pressure and body mass index in the elderly.¹²¹

Osteoporosis: There were 3 systematic reviews on osteoporosis.¹²²⁻¹²⁴ One review reported reduced rates of decline in bone mineral density (BMD) in postmenopausal women compared with sedentary controls in most included trials, but evidence was limited.¹²² Another review reported mixed results.¹²³ The third review did not report on BMD but found that tai chi did improve balance and so might prevent falls.¹²⁴ A recent trial found that the combination of tai chi and resistance training had the best outcome.¹²⁵ Again, the length of intervention might be important. A 9-month trial found that those who completed at least 75% of the classes in the tai chi group showed a statistically significant increase in BMD of the femoral head compared with the usual-care group.¹²⁶

Preliminary evidence of benefit. One systematic review on the primary prevention of stroke included 36 studies with more than 2300 participants and found a significant decrease in nonfatal stroke in the group that did tai chi ($P=.03$).¹²⁷ A Cochrane review of tai chi for primary prevention of cardiac disease concluded that the results were inconclusive, noting longer-term trials were needed.¹²⁸ Two systematic reviews showed that tai chi might be helpful for anxiety.^{69,129} One systematic review¹³⁰ and 3 recent trials¹³¹⁻¹³³ suggest tai chi has a beneficial effect on low back pain. One systematic review showed tai chi helped breast cancer patients after surgery, as it consistently improved the mobility of

the affected arm.¹³⁴ Three trials on tai chi and multiple sclerosis found promising results, especially for improving balance,¹³⁵⁻¹³⁷ and another trial showed improved quality of life.¹³⁸ Preliminary trials have shown a benefit for schizophrenia^{139,140} and posttraumatic stress disorder.^{141,142} Two trials indicated promising results for attention deficit disorder,^{143,144} and a systematic review is planned.¹⁴⁵ Single studies have shown that tai chi was helpful for those with spinal cord injury,¹⁴⁶ for those with traumatic brain injury,¹⁴⁷ and for postsurgical nasopharyngeal cancer patients to increase neck mobility.¹⁴⁸

Evidence of no direct benefit. There were 3 conditions for which the evidence suggested tai chi might not have a direct benefit: type 2 diabetes, rheumatoid arthritis, and chronic heart failure.

There were 4 systematic reviews on tai chi and diabetes¹⁴⁹⁻¹⁵² showing no effect on hemoglobin A_{1c}. A recent trial found no change in fasting glucose levels,¹²¹ but another showed tai chi did improve quality of life.¹⁵³ Three systematic reviews on tai chi for rheumatoid arthritis showed no improvement in joint tenderness, pain, or swelling but did find improved range of motion,¹⁵⁴⁻¹⁵⁶ and a recent study found improved quality of life.¹⁵⁷ Two systematic reviews on tai chi for heart failure showed no change in N-terminal pro-brain natriuretic peptide^{158,159} but found improved performance outcomes,¹⁵⁹ and another showed improved quality of life.¹⁶⁰

Tai chi for general health and fitness. Tai chi has a number of general health and fitness benefits. There is excellent evidence that tai chi consistently improves balance, demonstrated by 10 systematic reviews¹⁶¹⁻¹⁷⁰ and 3 recent trials.¹⁷¹⁻¹⁷³ There is excellent evidence from 5 systematic reviews^{159,174-177} and 2 recent trials^{172,178} that tai chi improves aerobic capacity, especially in those who have been sedentary. There is good evidence that tai chi can improve strength, especially in the lower limbs of adults who have been deconditioned,^{159,178-182} and there is preliminary evidence that tai chi might improve flexibility.^{163,173,178,182}

In terms of general health, there is fair evidence that tai chi increases overall well-being^{69,183-185} and improves sleep.^{186,187} Improvements in sleep seem to be associated with reduced cellular inflammatory markers such as C-reactive protein and proinflammatory cytokines.¹⁸⁸⁻¹⁹¹ There is 1 systematic review that suggests that tai chi might strengthen immune capacity¹⁹² and very preliminary evidence that it might improve kidney function^{121,193} and quality of life for hemodialysis patients.¹⁹⁴

The benefits of tai chi according to the different levels of evidence for specific conditions and general health and fitness are summarized in **Table 2**.^{6-19,25-59,62-95,98,100-114,117-127,129-144,146,147,149-194}

Table 2. Tai chi research: Summary of evidence from 120 systematic reviews and recent clinical trials; there is very little evidence for italicized conditions.

EXCELLENT EVIDENCE OF BENEFIT	GOOD EVIDENCE OF BENEFIT	FAIR EVIDENCE OF BENEFIT WITH MIXED RESULTS	PRELIMINARY EVIDENCE OF BENEFIT	EVIDENCE OF NO DIRECT BENEFIT
SPECIFIC CONDITIONS				
Preventing falls ⁶⁻¹⁹ <ul style="list-style-type: none"> • 14 systematic reviews Osteoarthritis ²⁵⁻³⁸ <ul style="list-style-type: none"> • 10 systematic reviews Parkinson disease ³⁹⁻⁵³ <ul style="list-style-type: none"> • 8 systematic reviews COPD rehabilitation ⁵⁴⁻⁵⁹ <ul style="list-style-type: none"> • 6 systematic reviews Improving cognitive capacity ⁶²⁻⁶⁸ <ul style="list-style-type: none"> • 5 systematic reviews 	Depression ⁶⁹⁻⁷⁷ <ul style="list-style-type: none"> • 8 systematic reviews Cardiac rehabilitation ⁷⁸⁻⁸⁸ <ul style="list-style-type: none"> • 6 systematic reviews Stroke rehabilitation ⁸⁹⁻⁹⁵ <ul style="list-style-type: none"> • 5 systematic reviews Cognitive impairment and dementia ^{65,98} <ul style="list-style-type: none"> • 2 systematic reviews 	Quality of life for cancer patients ¹⁰⁰⁻¹⁰⁷ <ul style="list-style-type: none"> • 7 systematic reviews Fibromyalgia ¹⁰⁸⁻¹¹⁴ <ul style="list-style-type: none"> • 4 systematic reviews Hypertension ¹¹⁷⁻¹²¹ <ul style="list-style-type: none"> • 4 systematic reviews Osteoporosis ¹²²⁻¹²⁶ <ul style="list-style-type: none"> • 3 systematic reviews 	Stroke prevention ¹²⁷ <ul style="list-style-type: none"> • 1 systematic review Anxiety ^{69,129} <ul style="list-style-type: none"> • 2 systematic reviews Low back pain ¹³⁰⁻¹³³ <ul style="list-style-type: none"> • 1 systematic review Postoperative arm mobility in breast cancer patients ¹³⁴ <ul style="list-style-type: none"> • 1 systematic review <i>Multiple sclerosis</i> ¹³⁵⁻¹³⁸ <i>Schizophrenia</i> ^{139,140} <i>PTSD</i> ^{141,142} <i>Attention deficit disorder</i> ^{143,144} <i>After brain and spinal cord injury</i> ^{146,147}	Diabetes (eg, HbA _{1c}) ¹⁴⁹⁻¹⁵³ <ul style="list-style-type: none"> • 4 systematic reviews Rheumatoid arthritis ¹⁵⁴⁻¹⁵⁷ <ul style="list-style-type: none"> • 3 systematic reviews Chronic heart failure ¹⁵⁸⁻¹⁶⁰ <ul style="list-style-type: none"> • 2 systematic reviews
GENERAL HEALTH AND FITNESS BENEFITS				
Balance, ¹⁶¹⁻¹⁷³ <ul style="list-style-type: none"> • 10 systematic reviews Aerobic capacity ^{159,174-178} <ul style="list-style-type: none"> • 5 systematic reviews 	Strength ^{159,178-182} <ul style="list-style-type: none"> • 2 systematic reviews 	Well-being ^{69,183-185} <ul style="list-style-type: none"> • 4 systematic reviews Sleep ¹⁸⁶⁻¹⁹¹ <ul style="list-style-type: none"> • 2 systematic reviews 	Flexibility ^{163,173,178,182} <ul style="list-style-type: none"> • 1 systematic review <i>Immune capacity</i> ¹⁹² <i>Kidney function</i> ^{121,193,194}	NA
COPD—chronic obstructive pulmonary disease, HbA _{1c} —hemoglobin A _{1c} , NA—not applicable, PTSD—posttraumatic stress disorder.				

Excellent safety profile. There was 1 systematic review of 153 trials assessing the safety of tai chi¹⁹⁵; only 50 included adverse event reporting. The most common adverse events were minor and primarily musculoskeletal, such as mild knee and back pain (presumably from misalignment); no intervention-related serious adverse events were reported.

DISCUSSION

There are more than 500 studies and 120 systematic reviews to assess the benefits of tai chi for 25 different conditions as well as for general health and fitness. The results have varied from excellent, good, fair, and preliminary evidence of benefit to evidence of no direct benefit. The strongest evidence of benefit is for preventing falls in older adults in the community, osteoarthritis, Parkinson disease, COPD rehabilitation, and improving cognitive capacity. The strength of this body of research is that it includes many systematic reviews and meta-analyses and, increasingly, high-quality RCTs. One of the strengths of our research is that we were consistently conservative in our assessments of the quality of evidence. For example, although more than 36 studies

have been done on tai chi for the primary prevention of stroke, and a meta-analysis found a statistically significant effect on nonfatal stroke, we still categorized this as preliminary evidence of benefit, as many of the trials were small and the overall effect was small. Tai chi appears to be excellent for balance and reestablishing aerobic capacity in those who have been deconditioned and for preventing or improving many of the common ailments associated with aging.

There are some limitations to this evidence, both from a research and a tai chi perspective. From a research perspective, many of the initial trials were small and had methodologic weakness. A key weakness was the lack of blinding of participants, but this was largely overcome by blinding those analyzing the results. Since tai chi has multiple features (Table 1),³ it is difficult to know what aspect of tai chi has the greatest effect.^{2,196} It is also not clear how tai chi works. For example, recent research has examined why tai chi seems to be so good for balance¹⁹⁷⁻²⁰⁰ and how it helps improve cognitive function.²⁰¹⁻²⁰³ Tai chi includes different styles, teachers, lengths, and frequencies. It is unclear whether one style might be better for some conditions than others, if longer classes are better than shorter classes, or whether 2 or more classes a week is optimal. A final limitation

of tai chi research is that trial lengths of 6 to 12 weeks might not be sufficient to assess benefit, especially for chronic conditions. Fortunately, a number of long-term studies are now under way.

From a tai chi perspective, research on this art form to date might not have revealed all of its benefits. In our experience, many people who practise tai chi describe benefits that have not yet been studied—such as improved digestion, warmer hands and feet, and generally feeling younger. Although it is useful to know that benefits can be seen after only a few weeks, those who have practised tai chi for many years would note that benefits continue to accrue even after decades of practice.

A lot more research is under way, including longer, more rigorous clinical trials and assessment of the benefits for other conditions. And there is a lot of interest in understanding how tai chi works at a biochemical level. Early evidence suggests tai chi alters cytokines associated with pain perception,²⁰⁴ enhances T cells,²⁰⁵ and affects mononuclear cell functions in patients with cancer.²⁰⁶ It would be interesting to assess the effect of tai chi on telomere length—an indicator of overall resilience and longevity.²⁰⁷

Case resolution

You empathize with B.G.'s situation and reassure her that there are some things that can be done to improve her health and well-being. You suggest that now that her children have moved out, it is a good time to start something new. You agree that tai chi is a good choice—it is a gentle aerobic activity that also improves balance and strength. You note there is good evidence that tai chi could help her depression and fair evidence that it might help improve her blood pressure. You discuss additional recommendations for her depression, hypertension, and blood sugar levels and arrange to see her again for follow-up.

Conclusion

Physicians can now provide evidence-based recommendations on tai chi to their patients, understanding that this is an active area of research. As with any exercise program, ongoing medical follow-up for any clinical condition is indicated.

Dr Huston is a family physician and a public health physician with the Department of Family Medicine and the School of Epidemiology, Public Health and Preventive Medicine at the University of Ottawa in Ontario. **Dr McFarlane** is a family physician recently working in the central Arctic.

Contributors

Both authors contributed to the literature review and interpretation, and to preparing the manuscript for submission.

Competing interests

Dr Huston has been practising tai chi for 3 years and assists in a Taoist Tai Chi health recovery class. **Dr McFarlane** has been learning from and teaching Taoist Tai Chi for 21 years and is a medical advisor to the Taoist Tai Chi Society of Canada.

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References

- Hempel S, Taylor SL, Solloway MR, Miake-Lye IM, Beroes JM, Shanman R, et al. *Evidence map of tai chi*. Los Angeles, CA: Evidence-based Synthesis Program Center; 2014.
- Wayne PM, Kaptchuk TJ. Challenges inherent to t'ai chi research: part I—t'ai chi as a complex multicomponent intervention. *J Altern Complement Med* 2008;14(1):95-102.
- Wayne PM. *The Harvard Medical School guide to tai chi: 12 weeks to a healthy body, strong heart, and sharp mind*. Boston, MA: Shambhala Publications Inc; 2012.
- International Taoist Tai Chi Society* [website]. Tallahassee, FL: International Taoist Tai Chi Society; 2016. Available from: www.taoist.org. Accessed 2016 Jun 25.
- Yang GY, Wang LQ, Ren J, Zhang Y, Li ML, Zhu YT, et al. Evidence base of clinical studies on tai chi: a bibliometric analysis. *PLoS One* 2015;10(3):e0120655.
- Mat S, Tan MP, Kamaruzzaman SB, Ng CT. Physical therapies for improving balance and reducing falls risk in osteoarthritis of the knee: a systematic review. *Age Ageing* 2015;44(1):16-24. Epub 2014 Aug 22.
- El-Khoury F, Cassou B, Charles MA, Dargent-Molina P. The effect of fall prevention exercise programmes on fall induced injuries in community dwelling older adults: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2013;347:f6234.
- Winter H, Watt K, Peel NM. Fall prevention interventions for community-dwelling older persons with cognitive impairment: a systematic review. *Int Psychogeriatr* 2013;25(02):215-27. Epub 2012 Oct 3.
- Gillespie LD, Robertson MC, Gillespie WJ, Sherrington C, Gates S, Clemson LM, et al. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2012;(9):CD007146.
- Schleicher MM, Wedam L, Wu G. Review of tai chi as an effective exercise on falls prevention in elderly. *Res Sports Med* 2012;20(1):37-58.
- Fairhall N, Sherrington C, Clemson L, Cameron ID. Do exercise interventions designed to prevent falls affect participation in life roles? A systematic review and meta-analysis. *Age Ageing* 2011;40(6):666-74. Epub 2011 Jul 14.
- Church J, Goodall S, Norman R, Haas M. An economic evaluation of community and residential aged care falls prevention strategies in NSW. *N S W Public Health Bull* 2011;22(4):60-8.
- Michael Y, Lin J, Whitlock E. *Interventions to prevent falls in older adults: an updated systematic review*. Evidence Syntheses no. 80. Rockville, MD: Agency for Healthcare Research and Quality; 2010. Available from: www.ncbi.nlm.nih.gov/books/NBK51685. Accessed 2016 Sep 23.
- Sherrington C, Whitney JC, Lord SR, Herbert RD, Cumming RG, Close JC. Effective exercise for the prevention of falls: a systematic review and meta-analysis. *J Am Geriatr Soc* 2008;56(12):2234-43.
- Logghe IH, Verhagen AP, Rademaker AC, Bierma-Zeinstra SM, van Rossum E, Faber MJ, et al. The effects of tai chi on fall prevention, fear of falling and balance in older people: a meta-analysis. *Prev Med* 2010;51(3-4):222-7. Epub 2010 Jun 15.
- Low S, Ang LW, Goh KS, Chew SK. A systematic review of the effectiveness of tai chi on fall reduction among the elderly. *Arch Gerontol Geriatr* 2009;48(3):325-31. Epub 2008 Apr 16.
- Gregory H, Watson MC. The effectiveness of tai chi as a fall prevention intervention for older adults: a systematic review. *Int J Health Promot Educ* 2009;47(3):94-100.
- Yildirim P, Ofluoglu D, Aydogan S, Akyuz G. Tai chi vs. combined exercise prescription: a comparison of their effects on factors related to falls. *J Back Musculoskelet Rehabil* 2016;29(3):493-501.
- Harling A, Simpson JP. A systematic review to determine the effectiveness of tai chi in reducing falls and fear of falling in older adults. *Phys Ther Rev* 2008;13(4):237-48.
- Kendrick D, Kumar A, Carpenter H, Zijlstra G, Skelton DA, Cook JR, et al. Exercise for reducing fear of falling in older people living in the community. *Cochrane Database Syst Rev* 2014;(11):CD009848.
- Zijlstra GA, van Haastregt JC, van Rossum E, van Eijk JT, Yardley L, Kempen GI. Interventions to reduce fear of falling in community-living older people: a systematic review. *J Am Geriatr Soc* 2007;55(4):603-15.
- Gleeson M, Sherrington C, Keay L. Exercise and physical training improve physical function in older adults with visual impairments but their effect on falls is unclear: a systematic review. *J Physiother* 2014;60(3):130-5. Epub 2014 Jul 25.
- Cameron ID, Gillespie LD, Robertson MC, Murray GR, Hill KD, Cumming RG, et al. Interventions for preventing falls in older people in care facilities and hospitals. *Cochrane Database Syst Rev* 2012;(12):CD005465.
- Day L, Hill KD, Stathakis VZ, Flicker L, Segal L, Cicuttini F, et al. Impact of tai-chi on falls among preclinically disabled older people. A randomized controlled trial. *J Am Med Dir Assoc* 2015;16(5):420-6. Epub 2015 Mar 10.
- Ye J, Cai S, Zhong W, Cai S, Zheng Q. Effects of tai chi for patients with knee osteoarthritis: a systematic review. *J Phys Ther Sci* 2014;26(7):1133-7. Epub 2014 Jul 30.
- Shengelia R, Parker SJ, Ballin M, George T, Reid MC. Complementary therapies for osteoarthritis: are they effective? *Pain Manag Nurs* 2013;14(4):e274-88. Epub 2012 Mar 21.
- Uthman OA, van der Windt DA, Jordan JL, Dziedzic KS, Healey EL, Peat GM, et al. Exercise for lower limb osteoarthritis: systematic review incorporating trial sequential analysis and network meta-analysis. *BMJ* 2013;347:f5555.

28. Lauche R, Langhorst J, Dobos G, Cramer H. A systematic review and meta-analysis of tai chi for osteoarthritis of the knee. *Complement Ther Med* 2013;21(4):396-406. Epub 2013 Jul 1.
29. Yan J, Gu W, Sun J, Zhang W, Li B, Pan L. Efficacy of tai chi on pain, stiffness and function in patients with osteoarthritis: a meta-analysis. *PLoS One* 2013;8(4):e61672.
30. Macfarlane GJ, Paudyal P, Doherty M, Ernst E, Lewith G, MacPherson H, et al. A systematic review of evidence for the effectiveness of practitioner-based complementary and alternative therapies in the management of rheumatic diseases: osteoarthritis. *Rheumatology* (Oxford) 2012;51(12):2224-33. Epub 2012 Aug 25.
31. Kang JW, Lee MS, Posadzki P, Ernst E. T'ai chi for the treatment of osteoarthritis: a systematic review and meta-analysis. *BMJ Open* 2011;1(1):e000035.
32. Selve TK, Innes KE. Mind-body therapies and osteoarthritis of the knee. *Curr Rheumatol Rev* 2009;5(4):204-11.
33. Escalante Y, Garcia-Hermoso A, Silva AJ, Barbosa TM. Physical exercise and reduction of pain in adults with lower limb osteoarthritis: a systematic review. *J Back Musculoskeletal Rehabil* 2010;23(4):175-86.
34. Hall A, Maher C, Latimer J, Ferreira M. The effectiveness of tai chi for chronic musculoskeletal pain conditions: a systematic review and meta-analysis. *Arthritis Care Res* 2009;61(6):717-24.
35. Tsai P, Chang JY, Beck C, Kuo Y, Keefe FJ. A pilot cluster-randomized trial of a 20-week tai chi program in elders with cognitive impairment and osteoarthritic knee: effects on pain and other health outcomes. *J Pain Symptom Manage* 2013;45(4):660-9. Epub 2012 Sep 24.
36. Callahan LF, Cleveland RJ, Altpeter M, Hackney B. Evaluation of tai chi program effectiveness for people with arthritis in the community: a randomized controlled trial. *J Aging Phys Act* 2016;24(1):101-10. Epub 2015 Jun 18.
37. Wang C, Iversen MD, McAlindon T, Harvey WF, Wong JB, Fielding RA, et al. Assessing the comparative effectiveness of tai chi versus physical therapy for knee osteoarthritis: design and rationale for a randomized trial. *BMC Complement Altern Med* 2014;14(1):333.
38. Hochberg MC, Altman RD, April KT, Benkhalti M, Guyatt G, McGowan J, et al. American College of Rheumatology 2012 recommendations for the use of nonpharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee. *Arthritis Care Res* 2012;64(4):465-74.
39. Zhou J, Yin T, Gao Q, Yang XC. A meta-analysis on the efficacy of tai chi in patients with Parkinson's disease between 2008 and 2014. *Evid Based Complement Alternat Med* 2015;2015:593263. Epub 2015 Jan 8.
40. Šumec R, Filip P, Sheardová K, Bareš M. Psychological benefits of nonpharmacological methods aimed for improving balance in Parkinson's disease: a systematic review. *Behav Neurol* 2015;2015:620674.
41. Yang Y, Qiu WQ, Hao YL, Lv ZY, Jiao SJ, Teng JF. The efficacy of traditional Chinese medical exercise for Parkinson's disease: a systematic review and meta-analysis. *PLoS One* 2015;10(4):e0122469.
42. Bega D, Gonzalez-Latapi P, Zadikoff C, Simuni T. A review of the clinical evidence for complementary and alternative therapies in Parkinson's disease. *Curr Treat Options Neurol* 2014;16(10):1-19.
43. Yang Y, Li X, Gong L, Zhu Y, Hao Y. Tai chi for improvement of motor function, balance and gait in Parkinson's disease: a systematic review and meta-analysis. *PLoS One* 2014;9(7):e102942.
44. Ni X, Liu S, Lu F, Shi X, Guo X. Efficacy and safety of tai chi for Parkinson's disease: a systematic review and meta-analysis of randomized controlled trials. *PLoS One* 2014;9(6):e99377. Epub 2014 Jun 13.
45. Toh SF. A systematic review on the effectiveness of tai chi exercise in individuals with Parkinson's disease from 2003 to 2013. *Hong Kong Occup Ther* 2013;23(2):69-81.
46. Lee MS, Lam P, Ernst E. Effectiveness of tai chi for Parkinson's disease: a critical review. *Parkinsonism Relat Disord* 2008;14(8):589-94. Epub 2008 Apr 18.
47. Li F, Harmer P, Fitzgerald K, Eckstrom E, Stock R, Galver J, et al. Tai chi and postural stability in patients with Parkinson's disease. *N Engl J Med* 2012;366(6):511-9.
48. Zhang TY, Hu Y, Nie ZY, Jin RX, Chen F, Guan Q, et al. Effects of tai chi and multimodal exercise training on movement and balance function in mild to moderate idiopathic Parkinson disease. *Am J Phys Med Rehabil* 2015;94(10 Suppl 1):921-9. Erratum in: *Am J Phys Med Rehabil* 2015;94(12):e129.
49. Gao Q, Leung A, Yang Y, Wei Q, Guan M, Jia C, et al. Effects of tai chi on balance and fall prevention in Parkinson's disease: a randomized controlled trial. *Clin Rehabil* 2014;28(8):748-53. Epub 2014 Feb 11.
50. Ghaffari BD, Kluger B. Mechanisms for alternative treatments in Parkinson's disease: acupuncture, tai chi, and other treatments. *Curr Neurol Neurosci Rep* 2014;14(6):1-11.
51. Li F, Harmer P, Liu Y, Eckstrom E, Fitzgerald K, Stock R, et al. A randomized controlled trial of patient-reported outcomes with tai chi exercise in Parkinson's disease. *Mov Disord* 2014;29(4):539-45. Epub 2013 Dec 29.
52. Li F, Harmer P. Economic evaluation of a Tai Ji Quan intervention to reduce falls in people with Parkinson disease, Oregon, 2008-2011. *Prev Chronic Dis* 2015;12:E120.
53. Yang Y, Hao YL, Tian WJ, Gong L, Zhang K, Shi QG, et al. The effectiveness of tai chi for patients with Parkinson's disease: study protocol for a randomized controlled trial. *Trials* 2015;16:111.
54. Guo JB, Chen BL, Lu YM, Zhang WY, Zhu ZJ, Yang YJ, et al. Tai chi for improving cardiopulmonary function and quality of life in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. *Clin Rehabil* 2016;30(8):750-64. Epub 2015 Sep 22.
55. Ng BH, Tsang HW, Ng BF, So CT. Traditional Chinese exercises for pulmonary rehabilitation: evidence from a systematic review. *J Cardiopulm Rehabil Prev* 2014;34(6):367-77.
56. Andrianopoulos V, Klijn P, Franssen FM, Spruit MA. Exercise training in pulmonary rehabilitation. *Clin Chest Med* 2014;35(2):313-22.
57. Wu W, Liu X, Wang L, Wang Z, Hu J, Yan J. Effects of tai chi on exercise capacity and health-related quality of life in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. *Int J Chron Obstruct Pulmon Dis* 2014;9:1253-63.
58. Ding M, Zhang W, Li K, Chen X. Effectiveness of t'ai chi and qigong on chronic obstructive pulmonary disease: a systematic review and meta-analysis. *J Altern Complement Med* 2014;20(2):79-86. Epub 2013 Aug 20.
59. Yan J, Guo Y, Yao H, Pan L. Effects of tai chi in patients with chronic obstructive pulmonary disease: preliminary evidence. *PLoS One* 2013;8(4):e61806.
60. Moy ML, Wayne PM, Litrownik D, Beach D, Klings ES, Davis RB, et al. Long-term Exercise after Pulmonary Rehabilitation (LEAP): design and rationale of a randomized controlled trial of tai chi. *Contemp Clin Trials* 2015;45(Pt B):458-67. Epub 2015 Sep 8.
61. Yeh GY, Wayne PM, Litrownik D, Roberts DH, Davis RB, Moy ML. Tai chi mind-body exercise in patients with COPD: study protocol for a randomized controlled trial. *Trials* 2014;15:337.
62. Leheret P, Villaseca P, Hogervorst E, Maki P, Henderson V. Individually modifiable risk factors to ameliorate cognitive aging: a systematic review and meta-analysis. *Climacteric* 2015;18(5):678-89. Epub 2015 Sep 11.
63. Zheng G, Liu F, Li S, Huang M, Tao J, Chen L. Tai chi and the protection of cognitive ability: a systematic review of prospective studies in healthy adults. *Am J Prev Med* 2015;49(1):89-97.
64. Kelly ME, Loughrey D, Lawlor BA, Robertson IH, Walsh C, Brennan S. The impact of exercise on the cognitive functioning of healthy older adults: a systematic review and meta-analysis. *Ageing Res Rev* 2014;16:12-31. Epub 2014 May 23.
65. Wayne PM, Walsh JN, Taylor-Piliae RE, Wells RE, Papp KV, Donovan NJ, et al. Effect of tai chi on cognitive performance in older adults: systematic review and meta-analysis. *J Am Geriatr Soc* 2014;62(1):25-39. Epub 2014 Jan 2.
66. Miller SM, Taylor-Piliae RE. Effects of tai chi on cognitive function in community-dwelling older adults: a review. *Geriatr Nurs* 2014;35(1):9-19. Epub 2013 Oct 24.
67. Walsh JN, Manor B, Hausdorff J, Novak V, Lipsitz L, Gow B, et al. Impact of short- and long-term tai chi mind-body exercise training on cognitive function in healthy adults: results from a hybrid observational study and randomized trial. *Glob Adv Health Med* 2015;4(4):38-48.
68. Sun J, Kanagawa K, Sasaki J, Ooki S, Xu H, Wang L. Tai chi improves cognitive and physical function in the elderly: a randomized controlled trial. *J Phys Ther Sci* 2015;27(5):1467-71. Epub 2015 May 26.
69. Wang F, Lee EO, Wu T, Benson H, Fricchione G, Wang W, et al. The effects of tai chi on depression, anxiety, and psychological well-being: a systematic review and meta-analysis. *Int J Behav Med* 2014;21(4):605-17.
70. Rosenbaum S, Tiedemann A, Sherrington C, Curtis J, Ward PB. Physical activity interventions for people with mental illness: a systematic review and meta-analysis. *J Clin Psychiatry* 2014;75(9):964-74.
71. Chi I, Jordan-Marsh M, Guo M, Xie B, Bai Z. Tai chi and reduction of depressive symptoms for older adults: a meta-analysis of randomized trials. *Geriatr Gerontol Int* 2013;13(1):3-12. Epub 2012 Jun 10.
72. Woltz PC, Chapa DW, Friedmann E, Son H, Akintade B, Thomas SA. Effects of interventions on depression in heart failure: a systematic review. *Heart Lung* 2012;41(5):469-83.
73. Bridle C, Spanjers K, Patel S, Atherton NM, Lamb SE. Effect of exercise on depression severity in older people: systematic review and meta-analysis of randomised controlled trials. *Br J Psychiatry* 2012;201(3):180-5.
74. Yohannes AM, Caton S. Management of depression in older people with osteoarthritis: a systematic review. *Ageing Ment Health* 2010;14(6):637-51.
75. Tsang HW, Chan EP, Cheung W. Effects of mindful and non-mindful exercises on people with depression: a systematic review. *Br J Clin Psychol* 2008;47(Pt 3):303-22. Epub 2008 Jan 31.
76. Liu X, Clark J, Siskind D, Williams GM, Byrne G, Yang JL, et al. A systematic review and meta-analysis of the effects of qigong and tai chi for depressive symptoms. *Complement Ther Med* 2015;23(4):516-34. Epub 2015 May 27.
77. Liu X, Vitetta L, Kostner K, Crompton D, Williams G, Brown WJ, et al. The effects of tai chi in centrally obese adults with depression symptoms. *Evid Based Complement Alternat Med* 2015;2015:879712. Epub 2015 Jan 21.
78. Nery RM, Zanini M, Ferrari JN, Silva CA, Farias LF, Comel JC, et al. Tai chi chuan for cardiac rehabilitation in patients with coronary arterial disease. *Arq Bras Cardiol* 2014;102(6):588-92. Epub 2014 Apr 17.
79. Yeh GY, Wang C, Wayne PM, Phillips R. Tai chi exercise for patients with cardiovascular conditions and risk factors: a systematic review. *J Cardiopulm Rehabil Prev* 2009;29(3):152-60.
80. Lee MS, Pittler MH, Taylor-Piliae RE, Ernst E. Tai chi for cardiovascular disease and its risk factors: a systematic review. *J Hypertens* 2007;25(9):1974-5.
81. Dalusung-Angosta A. The impact of tai chi exercise on coronary heart disease: a systematic review. *J Am Acad Nurse Pract* 2011;23(7):376-81. Epub 2011 Mar 31.
82. Lan C, Chen S, Wong M, Lai JS. Tai chi chuan exercise for patients with cardiovascular disease. *Evid Based Complement Alternat Med* 2013;2013:983208.

83. Ng S, Wang C, Ho R, Ziea T, Wong V, Chan CL. Tai chi exercise for patients with heart disease: a systematic review of controlled clinical trials. *Altern Ther Health Med* 2012;18(3):16-22. Erratum in: *Altern Ther Health Med* 2012;18(6):79.
84. Robins JL, Elswick R Jr, Sturgill J, McCain NL. The effects of tai chi on cardiovascular risk in women. *Am J Health Promot* 2015 Aug 25. Epub ahead of print.
85. Xu F, Letendre J, Bekke J, Beebe N, Mahler L, Lofgren IE, et al. Impact of a program of tai chi plus behaviorally based dietary weight loss on physical functioning and coronary heart disease risk factors: a community-based study in obese older women. *J Nutr Gerontol Geriatr* 2015;34(1):50-65.
86. Song Q, Xu R, Shen G, Zhang Q, Ma M, Zhao X, et al. Influence of tai chi exercise cycle on the senile respiratory and cardiovascular circulatory function. *Int J Clin Exp Med* 2014;7(3):770-4.
87. Nery RM, Zanini M, de Lima JB, Bühler RP, da Silveira AD, Stein R. Tai chi chuan improves functional capacity after myocardial infarction: a randomized clinical trial. *Am Heart J* 2015;169(6):854-60. Epub 2015 Mar 13.
88. Salmoirago-Blotcher E, Wayne P, Bock BC, Dunsiger S, Wu W, Stabile L, et al. Design and methods of the Gentle Cardiac Rehabilitation Study—a behavioral study of tai chi exercise for patients not attending cardiac rehabilitation. *Contemp Clin Trials* 2015;43:243-51. Epub 2015 Jun 24.
89. Ding M. Tai chi for stroke rehabilitation: a focused review. *Am J Phys Med Rehabil* 2012;91(12):1091-6.
90. Taylor-Piliae RE, Haskell WL. Tai chi exercise and stroke rehabilitation. *Top Stroke Rehabil* 2007;14(4):9-22.
91. Rabadi MH. Review of the randomized clinical stroke rehabilitation trials in 2009. *Med Sci Monit* 2011;17(2):RA25-43.
92. Chen B, Guo J, Liu M, Li X, Zou J, Chen X, et al. Effect of traditional Chinese exercise on gait and balance for stroke: a systematic review and meta-analysis. *PLoS One* 2015;10(8):e0135932.
93. Kim H, Kim YL, Lee SM. Effects of therapeutic tai chi on balance, gait, and quality of life in chronic stroke patients. *Int J Rehabil Res* 2015;38(2):156-61.
94. Taylor-Piliae RE, Hoke TM, Hepworth JT, Latt LD, Najafi B, Coull BM. Effect of tai chi on physical function, fall rates and quality of life among older stroke survivors. *Arch Phys Med Rehabil* 2014;95(5):816-24. Epub 2014 Jan 17.
95. Tao J, Rao T, Lin L, Liu W, Wu Z, Zheng G, et al. Evaluation of tai chi yunshou exercises on community-based stroke patients with balance dysfunction: a study protocol of a cluster randomized controlled trial. *BMC Complement Altern Med* 2015;15(1):31.
96. Taylor-Piliae RE, Coull BM. Community-based Yang-style tai chi is safe and feasible in chronic stroke: a pilot study. *Clin Rehabil* 2012;26(2):121-31. Epub 2011 Sep 21.
97. Zhang Y, Liu H, Zhou L, Chen K, Jin H, Zou Y, et al. Applying tai chi as a rehabilitation program for stroke patients in the recovery phase: study protocol for a randomized controlled trial. *Trials* 2014;15:484.
98. Forbes D, Thiessen EJ, Blake CM, Forbes SC, Forbes S. Exercise programs for people with dementia. *Cochrane Database Syst Rev* 2013;(12):CD006489.
99. Fogarty JN, Murphy KJ, McFarlane B, Montero-Odasso M, Wells J, Troyer AK, et al. Taoist Tai Chi® and memory intervention for individuals with mild cognitive impairment. *J Aging Phys Act* 2016;24(2):169-80. Epub 2015 Apr 2.
100. Zeng Y, Luo T, Xie H, Huang M, Cheng AS. Health benefits of qigong or tai chi for cancer patients: a systematic review and meta-analyses. *Complement Ther Med* 2014;22(1):173-86. Epub 2013 Dec 18.
101. Yan JH, Pan L, Zhang XM, Sun CX, Cui GH. Lack of efficacy of tai chi in improving quality of life in breast cancer survivors: a systematic review and meta-analysis. *Asian Pac J Cancer Prev* 2014;15(8):3715-20.
102. Mishra SI, Scherer RW, Geigle PM, Berlanstein DR, Topaloglu O, Gotay CC, et al. Exercise interventions on health-related quality of life for cancer survivors. *Cochrane Database Syst Rev* 2012;(8):CD007566.
103. Brown JC, Huedo-Medina TB, Pescatello LS, Pescatello SM, Ferrer RA, Johnson BT. Efficacy of exercise interventions in modulating cancer-related fatigue among adult cancer survivors: a meta-analysis. *Cancer Epidemiol Biomarkers Prev* 2011;20(1):123-33. Epub 2010 Nov 4.
104. Lee MS, Choi TY, Ernst E. Tai chi for breast cancer patients: a systematic review. *Breast Cancer Res Treat* 2010;120(2):309-16. Epub 2010 Feb 2.
105. Lee MS, Pittler MH, Ernst E. Is tai chi an effective adjunct in cancer care? A systematic review of controlled clinical trials. *Support Care Cancer* 2007;15(6):597-601. Epub 2007 Feb 21.
106. Mishra SI, Scherer RW, Geigle PM, Berlanstein DR, Topaloglu O, Gotay CC, et al. Exercise interventions on health-related quality of life for people with cancer during active treatment. *Cochrane Database Syst Rev* 2012;(8):CD008465.
107. Sprod LK, Janelins MC, Palesh OG, Carroll JK, Heckler CE, Peppone LJ, et al. Health-related quality of life and biomarkers in breast cancer survivors participating in tai chi chuan. *J Cancer Surviv* 2012;6(2):146-54. Epub 2011 Dec 10.
108. Lauche R, Cramer H, Häuser W, Dobos G, Langhorst J. A systematic overview of reviews for complementary and alternative therapies in the treatment of the fibromyalgia syndrome. *Evid Based Complement Alternat Med* 2015;2015:610615.
109. Bidonde J, Busch AJ, Bath B, Milosavljevic S. Exercise for adults with fibromyalgia: an umbrella systematic review with synthesis of best evidence. *Curr Rheumatol Rev* 2014;10(1):45-79.
110. Mist SD, Firestone KA, Jones KD. Complementary and alternative exercise for fibromyalgia: a meta-analysis. *J Pain Res* 2013;6:247-60. Epub 2013 Mar 27.
111. Langhorst J, Klose P, Dobos GJ, Bernardy K, Häuser W. Efficacy and safety of meditative movement therapies in fibromyalgia syndrome: a systematic review and meta-analysis of randomized controlled trials. *Rheumatol Int* 2013;33(1):193-207. Epub 2012 Feb 15.
112. Wang C, Schmid CH, Rones R, Kalish R, Yin J, Goldenberg DL, et al. A randomized trial of tai chi for fibromyalgia. *N Engl J Med* 2010;363(8):743-54.
113. Segura-Jiménez V, Romero-Zurita A, Carbonell-Baeza A, Aparicio V, Ruiz JR, Delgado-Fernández M. Effectiveness of tai-chi for decreasing acute pain in fibromyalgia patients. *Int J Sports Med* 2014;35(05):418-23. Epub 2013 Nov 7.
114. Jones KD, Sherman CA, Mist SD, Carson JW, Bennett RM, Li F. A randomized controlled trial of 8-form tai chi improves symptoms and functional mobility in fibromyalgia patients. *Clin Rheumatol* 2012;31(8):1205-14. Epub 2012 May 13.
115. Wang C, McAlindon T, Fielding RA, Harvey WF, Driban JB, Price LL, et al. A novel comparative effectiveness study of tai chi versus aerobic exercise for fibromyalgia: study protocol for a randomized controlled trial. *Trials* 2015;16:34.
116. Ablin J, Fitzcharles M, Buskila D, Shir Y, Sommer C, Häuser W. Treatment of fibromyalgia syndrome: recommendations of recent evidence-based interdisciplinary guidelines with special emphasis on complementary and alternative therapies. *Evid Based Complement Alternat Med* 2013;2015:485272.
117. Wang J, Feng B, Yang X, Liu W, Teng F, Li S, et al. Tai chi for essential hypertension. *Evid Based Complement Alternat Med* 2013;2013:215254. Epub 2013 Aug 6.
118. Lee MS, Lee EN, Kim JJ, Ernst E. Tai chi for lowering resting blood pressure in the elderly: a systematic review. *J Eval Clin Pract* 2010;16(4):818-24. Epub 2010 Jun 14.
119. Lee MS, Pittler MH, Taylor-Piliae RE, Ernst E. Tai chi for cardiovascular disease and its risk factors. *J Hypertension* 2007;25(9):1974-7.
120. Yeh GY, Wang C, Wayne PM, Phillips RS. The effect of tai chi exercise on blood pressure: a systematic review. *Prev Cardiol* 2008;11(2):82-9.
121. Sun J, Buys N. Community-based mind-body meditative tai chi program and its effects on improvement of blood pressure, weight, renal function, serum lipoprotein, and quality of life in Chinese adults with hypertension. *Am J Cardiol* 2015;116(7):1076-81. Epub 2015 Jul 16.
122. Wayne PM, Kiel DP, Krebs DE, Davis RB, Savetsky-German J, Connelly M, et al. The effects of tai chi on bone mineral density in postmenopausal women: a systematic review. *Arch Phys Med Rehabil* 2007;88(5):673-80.
123. Lee M, Pittler M, Shin B, Ernst E. Tai chi for osteoporosis: a systematic review. *Osteoporos Int* 2008;19(2):139-46. Epub 2007 Oct 23.
124. Chang TJ, Ting YT, Sheu SL, Chang HY. Effects of tai chi in postmenopausal women with osteoporosis: a systematic review [article in Chinese]. *Hu Li Za Zhi* 2014;61(5):75-84.
125. Wang H, Yu B, Chen W, Lu Y, Yu D. Simplified tai chi resistance training versus traditional tai chi in slowing bone loss in postmenopausal women. *Evid Based Complement Alternat Med* 2015;2015:379451.
126. Wayne PM, Kiel DP, Buring JE, Connors EM, Bonato P, Yeh GY, et al. Impact of tai chi exercise on multiple fracture-related risk factors in postmenopausal osteopenic women: a pilot pragmatic, randomized trial. *BMC Complement Altern Med* 2012;12:7.
127. Zheng G, Huang M, Liu F, Li S, Tao J, Chen L. Tai chi chuan for the primary prevention of stroke in middle-aged and elderly adults: a systematic review. *Evid Based Complement Alternat Med* 2015;2015:742152.
128. Hartley L, Flowers N, Lee MS, Ernst E, Rees K. Tai chi for primary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2014;(4):CD010366.
129. Sharma M, Haider T. Tai chi as an alternative and complimentary therapy for anxiety: a systematic review. *Evid Based Complement Alternat Med* 2015;20(2):143-53. Epub 2014 Dec 8.
130. Yuan QL, Guo TM, Liu L, Sun F, Zhang YG. Traditional Chinese medicine for neck pain and low back pain: a systematic review and meta-analysis. *PLoS One* 2015;10(2):e0117146.
131. Lu T, Song QH, Xu RM, Zhang LY. Effect of tai chi exercise in combination with auricular plaster on patients with lumbar muscle strain. *Int J Clin Exp Med* 2015;8(2):2949-53.
132. Hall AM, Maher CG, Lam P, Ferreira M, Latimer J. Tai chi exercise for treatment of pain and disability in people with persistent low back pain: a randomized controlled trial. *Arthritis Care Res* 2011;63(11):1576-83.
133. Cho Y. Effects of tai chi on pain and muscle activity in young males with acute low back pain. *J Phys Ther Sci* 2014;26(5):679-81. Epub 2014 May 29.
134. Pan Y, Yang K, Shi X, Liang H, Zhang F, Lv Q. Tai chi chuan exercise for patients with breast cancer: a systematic review and meta-analysis. *Evid Based Complement Alternat Med* 2015;2015:535237.
135. Azimzadeh E, Hosseini MA, Nourozi K, Davidson PM. Effect of tai chi chuan on balance in women with multiple sclerosis. *Complement Ther Clin Pract* 2015;21(1):57-60. Epub 2014 Nov 27.
136. Burschka JM, Keune PM, Oy UH, Oschmann P, Kuhn P. Mindfulness-based interventions in multiple sclerosis: beneficial effects of tai chi on balance, coordination, fatigue and depression. *BMC Neurol* 2014;14(1):165.
137. Mills N, Allen J, Carey-Morgan S. Does tai chi/qi gong help patients with multiple sclerosis? *J Bodyw Mov Ther* 2000;4(1):39-48.
138. Husted C, Pham L, Hekking A, Niederman R. Improving quality of life for people with chronic conditions: the example of tai chi and multiple sclerosis. *Altern Ther Health Med* 1999;5(5):70-4.

139. Vera-García E, Mayoral-Cleries F, Vancampfort D, Stubbs B, Cuesta-Vargas AI. A systematic review of the benefits of physical therapy within a multidisciplinary care approach for people with schizophrenia: an update. *Psychiatry Res* 2015;229(3):828-39. Epub 2015 Jul 31.
140. Ho RT, Wan AH, Au-Yeung FS, Lo PH, Siu PJ, Wong CP, et al. The psychophysiological effects of tai-chi and exercise in residential schizophrenic patients: a 3-arm randomized controlled trial. *BMC Complement Altern Med* 2014;14:364.
141. Kim SH, Schneider SM, Kravitz L, Mermier C, Burge MR. Mind-body practices for posttraumatic stress disorder. *J Investig Med* 2013;61(5):827-34.
142. Grodin MA, Piwowarczyk L, Fulker D, Bazazi AR, Saper RB. Treating survivors of torture and refugee trauma: a preliminary case series using qigong and t'ai chi. *J Altern Complement Med* 2008;14(7):801-6.
143. Converse AK, Ahlers EO, Travers BG, Davidson RJ. Tai chi training reduces self-report of inattention in healthy young adults. *Front Hum Neurosci* 2014;8:13.
144. Ni X, Zhang-James Y, Han X, Lei S, Sun J, Zhou R. Traditional Chinese medicine in the treatment of ADHD: a review. *Child Adolesc Psychiatr Clin N Am* 2014;23(4):853-81.
145. Catalá-López F, Hutton B, Núñez-Beltrán A, Mayhew AD, Page MJ, Ridaio M, et al. The pharmacological and non-pharmacological treatment of attention deficit hyperactivity disorder in children and adolescents: protocol for a systematic review and network meta-analysis of randomized controlled trials. *Syst Rev* 2015;4:19. Epub 2015 Feb 27.
146. Tsang WW, Gao KL, Chan K, Purves S, Macfarlane DJ, Fong SS. Sitting tai chi improves the balance control and muscle strength of community-dwelling persons with spinal cord injuries: a pilot study. *Evid Based Complement Alternat Med* 2015;2015:523852.
147. Gemmell C, Leatham JM. A study investigating the effects of tai chi chuan: individuals with traumatic brain injury compared to controls. *Brain Inj* 2006;20(2):151-6.
148. Fong SS, Ng SS, Lee HW, Pang MY, Luk WS, Chung JW, et al. The effects of a 6-month tai chi qigong training program on temporomandibular, cervical, and shoulder joint mobility and sleep problems in nasopharyngeal cancer survivors. *Integr Cancer Ther* 2015;14(1):16-25. Epub 2014 Nov 18.
149. Lee MS, Jun JH, Lim HJ, Lim HS. A systematic review and meta-analysis of tai chi for treating type 2 diabetes. *Maturitas* 2015;80(1):14-23. Epub 2014 Sep 29.
150. Van der Heijden MM, van Dooren FE, Pop VJ, Pouwer F. Effects of exercise training on quality of life, symptoms of depression, symptoms of anxiety and emotional well-being in type 2 diabetes mellitus: a systematic review. *Diabetologia* 2013;56(6):1210-25. Epub 2013 Mar 23.
151. Yan JH, Gu WJ, Pan L. Lack of evidence on tai chi-related effects in patients with type 2 diabetes mellitus: a meta-analysis. *Exp Clin Endocrinol Diabetes* 2013;121(5):266-71. Epub 2013 Feb 28.
152. Lee MS, Choi TY, Lim HJ, Ernst E. Tai chi for management of type 2 diabetes mellitus: a systematic review. *Chin J Integr Med* 2011;17(10):789-93. Epub 2011 Jul 30.
153. Liu X, Miller YD, Burton NW, Chang JH, Brown WJ. The effect of tai chi on health-related quality of life in people with elevated blood glucose or diabetes: a randomized controlled trial. *Qual Life Res* 2013;22(7):1783-6. Epub 2012 Nov 10.
154. Han A, Judd M, Welch V, Wu T, Tugwell P, Wells G. Tai chi for rheumatoid arthritis. *Cochrane Database Syst Rev* 2004;(3):CD004849.
155. Macfarlane GJ, Paudyal P, Doherty M, Ernst E, Lewith G, MacPherson H, et al. A systematic review of evidence for the effectiveness of practitioner-based complementary and alternative therapies in the management of rheumatic diseases: rheumatoid arthritis. *Rheumatology (Oxford)* 2012;51(9):1707-13. Epub 2012 Aug 25.
156. Lee MS, Pittler MH, Ernst E. Tai chi for rheumatoid arthritis: systematic review. *Rheumatology (Oxford)* 2007;46(11):1648-51. Epub 2007 Jul 18.
157. Waite-Jones JM, Hale CA, Lee HY. Psychosocial effects of tai chi exercise on people with rheumatoid arthritis. *J Clin Nurs* 2013;22(21-22):3053-61. Epub 2013 Sep 13.
158. Pan L, Yan J, Guo Y, Yan J. Effects of tai chi training on exercise capacity and quality of life in patients with chronic heart failure: a meta-analysis. *Eur J Heart Fail* 2013;15(3):316-23. Epub 2012 Oct 25.
159. Chen YW, Hunt MA, Campbell KL, Peill K, Reid WD. The effect of tai chi on four chronic conditions—cancer, osteoarthritis, heart failure and chronic obstructive pulmonary disease: a systematic review and meta-analyses. *Br J Sports Med* 2016;50(7):397-407. Epub 2015 Sep 17.
160. Sun J, Buys N, Jayasinghe R. Effects of community-based meditative tai chi programme on improving quality of life, physical and mental health in chronic heart-failure participants. *Aging Ment Health* 2014;18(3):289-95. Epub 2014 Jan 9.
161. Chan WW, Bartlett DJ. Effectiveness of tai chi as a therapeutic exercise in improving balance and postural control. *Phys Occup Ther Geriatr* 2000;17(3):1-22.
162. Song R, Ahn S, So H, Lee EH, Chung Y, Park M. Effects of t'ai chi on balance: a population-based meta-analysis. *J Altern Complement Med* 2015;21(3):141-51. Epub 2015 Feb 4.
163. Huang Y, Liu X. Improvement of balance control ability and flexibility in the elderly tai chi chuan (TCC) practitioners: a systematic review and meta-analysis. *Arch Gerontol Geriatr* 2015;60(2):233-8. Epub 2014 Nov 18.
164. Leung DP, Chan CK, Tsang HW, Tsang WW, Jones AY. Tai chi as an intervention to improve balance and reduce falls in older adults: a systematic and meta-analytical review. *Altern Ther Health Med* 2011;17(1):40-8.
165. Wootton AC. An integrative review of tai chi research: an alternative form of physical activity to improve balance and prevent falls in older adults. *Orthop Nurs* 2010;29(2):108-16.
166. Howe TE, Rochester L, Neil F, Skelton DA, Ballinger C. Exercise for improving balance in older people. *Cochrane Database Syst Rev* 2011;(11):CD004963.
167. Komagata S, Newton R. The effectiveness of tai chi on improving balance in older adults: an evidence-based review. *J Geriatr Phys Ther* 2003;26(2):9-16.
168. Liu H, Frank A. Tai chi as a balance improvement exercise for older adults: a systematic review. *J Geriatr Phys Ther* 2010;33(3):103-9.
169. Maciaszek J, Osiński W. The effects of tai chi on body balance in elderly people—a review of studies from the early 21st century. *Am J Chin Med* 2010;38(2):219-29.
170. Wu G. Evaluation of the effectiveness of tai chi for improving balance and preventing falls in the older population—a review. *J Am Geriatr Soc* 2002;50(4):746-54.
171. Alsubihean A, Petrofsky J, Daher N, Lohman E, Balbas E. Effect of tai chi exercise combined with mental imagery theory in improving balance in a diabetic and elderly population. *Med Sci Monit* 2015;21:3054-61.
172. Zeng R, Lin J, Wu S, Chen L, Chen S, Gao H, et al. A randomized controlled trial: preoperative home-based combined tai chi and strength training (TCST) to improve balance and aerobic capacity in patients with total hip arthroplasty (THA). *Arch Gerontol Geriatr* 2015;60(2):265-71. Epub 2014 Dec 13.
173. Zheng G, Lan X, Li M, Ling K, Lin H, Chen L, et al. Effectiveness of tai chi on physical and psychological health of college students: results of a randomized controlled trial. *PLoS One* 2015;10(7):e0132605.
174. Escalante Y, García-Hermoso A, Saaavedra JM. Effects of exercise on functional aerobic capacity in lower limb osteoarthritis: a systematic review. *J Sci Med Sport* 2011;14(3):190-8. Epub 2010 Nov 25.
175. Lee MS, Lee EN, Ernst E. Is tai chi beneficial for improving aerobic capacity? A systematic review. *Br J Sports Med* 2009;43(8):569-73. Epub 2008 Nov 19.
176. Taylor-Piliae RE. The effectiveness of tai chi exercise in improving aerobic capacity: an updated meta-analysis. *Med Sport Sci* 2008;52:40-53.
177. Taylor-Piliae RE, Froelicher ES. Effectiveness of tai chi exercise in improving aerobic capacity: a meta-analysis. *J Cardiovasc Nurs* 2004;19(1):48-57.
178. Kim TH, Eke Dogra S, Al-Sahab B, Tamim H. Comparison of functional fitness outcomes in experienced and inexperienced older adults after 16-week tai chi program. *Altern Ther Health Med* 2014;20(3):20-5.
179. Liu B, Liu ZH, Zhu HE, Mo JC, Cheng DH. Effects of tai chi on lower-limb myodynamia in the elderly people: a meta-analysis. *J Tradit Chin Med* 2011;31(2):141-6.
180. Zhou M, Peng N, Dai Q, Li HW, Shi RG, Huang W. Effect of tai chi on muscle strength of the lower extremities in the elderly. *Chin J Integr Med* 2015 May 27. Epub ahead of print.
181. Lin SF, Sung HC, Li TL, Hsieh TC, Lan HC, Perng SJ, et al. The effects of tai-chi in conjunction with thera-band resistance exercise on functional fitness and muscle strength among community-based older people. *J Clin Nurs* 2015;24(9-10):1357-66. Epub 2015 Jan 26.
182. Manson J, Rotondi M, Jammik V, Arden C, Tamim H. Effect of tai chi on musculoskeletal health-related fitness and self-reported physical health changes in low income, multiple ethnicity mid to older adults. *BMC Geriatr* 2013;13:114.
183. Wang C, Bannuru R, Ramel J, Kupelnick B, Scott T, Schmid CH. Tai chi on psychological well-being: systematic review and meta-analysis. *BMC Complement Altern Med* 2010;10:23.
184. Wang WC, Zhang AL, Rasmussen B, Lin LW, Dunning T, Kang SW, et al. The effect of tai chi on psychosocial well-being: a systematic review of randomized controlled trials. *J Acupunct Meridian Stud* 2009;2(3):171-81.
185. Dechamps A, Lafont L, Bourdel-Marchasson I. Effects of tai chi exercises on self-efficacy and psychological health. *Eur Rev Aging Phys Act* 2007;4(1):25-32.
186. Du S, Dong J, Zhang H, Jin S, Xu G, Liu Z, et al. Taichi exercise for self-rated sleep quality in older people: a systematic review and meta-analysis. *Int J Nurs Stud* 2015;52(1):368-79. Epub 2014 May 28.
187. Sarris J, Byrne GJ. A systematic review of insomnia and complementary medicine. *Sleep Med Rev* 2011;15(2):99-106. Epub 2010 Jun 8.
188. Irwin MR, Olmstead R, Breen EC, Witaranta T, Carrillo C, Sadeghi N, et al. Cognitive behavioral therapy and tai chi reverse cellular and genomic markers of inflammation in late life insomnia: a randomized controlled trial. *Biol Psychiatry* 2015;78(10):721-9. Epub 2015 Feb 4.
189. Irwin MR, Olmstead R, Breen EC, Witaranta T, Carrillo C, Sadeghi N, et al. Tai chi, cellular inflammation, and transcriptome dynamics in breast cancer survivors with insomnia: a randomized controlled trial. *J Natl Cancer Inst Monogr* 2014;2014(50):295-301.
190. Irwin MR, Olmstead R, Carrillo C, Sadeghi N, Breen EC, Witaranta T, et al. Cognitive behavioral therapy vs. tai chi for late life insomnia and inflammatory risk: a randomized controlled comparative efficacy trial. *Sleep* 2014;37(9):1543-52.
191. Carroll JE, Seeman TE, Olmstead R, Melendez G, Sadakane R, Bootzin R, et al. Improved sleep quality in older adults with insomnia reduces biomarkers of disease risk: pilot results from a randomized controlled comparative efficacy trial. *Psychoneuroendocrinology* 2015;55:184-92. Epub 2015 Feb 25.

192. Ho RT, Wang CW, Ng SM, Ho AH, Ziea ET, Wong VT, et al. The effect of t'ai chi exercise on immunity and infections: a systematic review of controlled trials. *J Altern Complement Med* 2013;19(5):389-96. Epub 2013 Jan 14.
193. Shi ZM, Wen HP, Liu FR, Yao CX. The effects of tai chi on the renal and cardiac functions of patients with chronic kidney and cardiovascular diseases. *J Phys Ther Sci* 2014;26(11):1733-6. Epub 2014 Nov 13.
194. Shahgholian N, Eshghinezhad A, Mortazavi M. The effect of tai chi exercise on quality of life in hemodialysis patients. *Iran J Nurs Midwifery Res* 2014;19(2):152-8.
195. Wayne PM, Berkowitz DL, Litrownik DE, Buring JE, Yeh GY. What do we really know about the safety of tai chi? A systematic review of adverse event reports in randomized trials. *Arch Phys Med Rehabil* 2014;95(12):2470-83. Epub 2014 May 27.
196. Wayne PM, Kaptchuk TJ. Challenges inherent to t'ai chi research: part II—defining the intervention and optimal study design. *J Altern Complement Med* 2008;14(2):191-7.
197. Wayne PM, Hausdorff JM, Lough M, Gow BJ, Lipsitz L, Novak V, et al. Tai chi training may reduce dual task gait variability, a potential mediator of fall risk, in healthy older adults: cross-sectional and randomized trial studies. *Front Hum Neurosci* 2015;9:332.
198. Chang YT, Huang CF, Chang JH. The effect of tai chi chuan on obstacle crossing strategy in older adults. *Res Sports Med* 2015;23(3):315-29. Epub 2015 Jun 26.
199. Zhou J, Chang S, Cong Y, Qin M, Sun W, Lian J, et al. Effects of 24 weeks of tai chi exercise on postural control among elderly women. *Res Sports Med* 2015;23(3):302-14. Erratum in: *Res Sports Med* 2015;23(4):424. Epub 2015 Sep 4.
200. Jiménez-Martin PJ, Hernández-Neira JL. Biomechanical considerations of foot-ground contact in t'ai chi chuan. *J Altern Complement Med* 2014;20(10):743-9. Epub 2014 Aug 12.
201. Zheng Z, Zhu X, Yin S, Wang B, Niu Y, Huang X, et al. Combined cognitive-psychological-physical intervention induces reorganization of intrinsic functional brain architecture in older adults. *Neural Plast* 2015;2015:713104.
202. Fong DY, Chi LK, Li F, Chang YK. The benefits of endurance exercise and tai chi chuan for the task-switching aspect of executive function in older adults: an ERP study. *Front Aging Neurosci* 2014;6:295.
203. Yin S, Zhu X, Li R, Niu Y, Wang B, Zheng Z, et al. Intervention-induced enhancement in intrinsic brain activity in healthy older adults. *Sci Rep* 2014;4:7309.
204. Geib RW, Li H, Waite GN. A pilot study on the effect of tai chi exercise on peripheral blood cytokines associated with nociceptive pain in healthy volunteers. *Biomed Sci Instrum* 2014;50:125-31.
205. Yeh SH, Chuang H, Lin LW, Hsiao CY, Eng HL. Regular tai chi chuan exercise enhances functional mobility and CD4CD25 regulatory T cells. *Br J Sports Med* 2006;40(3):239-43.
206. Liu J, Chen P, Wang R, Yuan Y, Wang X, Li C. Effect of tai chi on mononuclear cell functions in patients with non-small cell lung cancer. *BMC Complement Altern Med* 2015;15:3.
207. Franzke B, Neubauer O, Wagner KH. Super DNAGing—new insights into DNA integrity, genome stability and telomeres in the oldest old. *Mutat Res Rev Mutat Res* 2015;766:48-57. Epub 2015 Aug 28.

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