

## Annotated Bibliography on Tai Chi Research

June through December, 2010

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"Retraction. Preliminary study of the effects of Tai Chi and Qigong medical exercise on indicators of metabolic syndrome and glycaemic control in adults with raised blood glucose levels." *Br J Sports Med* 44(8): 608.

Bennell, K. L. and R. S. Hinman "A review of the clinical evidence for exercise in osteoarthritis of the hip and knee." *J Sci Med Sport* 14(1): 4-9.

Osteoarthritis (OA) is a chronic joint disease with the hip and knee being commonly affected lower limb sites. Osteoarthritis causes pain, stiffness, swelling, joint instability and muscle weakness, all of which can lead to impaired physical function and reduced quality of life. This review of evidence provides recommendations for exercise prescription in those with hip or knee OA. A narrative review was performed. Conservative non-pharmacological strategies, particularly exercise, are recommended by all clinical guidelines for the management of OA and meta-analyses support these exercise recommendations. Aerobic, strengthening, aquatic and Tai chi exercise are beneficial for improving pain and function in people with OA with benefits seen across the range of disease severities. The optimal exercise dosage is yet to be determined and an individualized approach to exercise prescription is required based on an assessment of impairments, patient preference, co-morbidities and accessibility. Maximising adherence is a key element dictating success of exercise therapy. This can be enhanced by the use of supervised exercise sessions (possibly in class format) in the initial exercise period followed by home exercises. Bringing patients back for intermittent consultations with the exercise practitioner, or attendance at "refresher" group exercise classes may also assist long-term adherence and improved patient outcomes. Few studies have evaluated the effects of exercise on structural disease progression and there is currently no evidence to show that exercise can be disease modifying. Exercise plays an important role in managing symptoms in those with hip and knee OA.

Bridenbaugh, S. A. and R. W. Kressig "Laboratory Review: The Role of Gait Analysis in Seniors' Mobility and Fall Prevention." *Gerontology*.

Walking is a complex motor task generally performed automatically by healthy adults. Yet, by the elderly, walking is often no longer performed automatically. Older adults require more attention for motor control while walking than younger adults. Falls, often with serious consequences, can be the result. Gait impairments are one of the biggest risk factors for falls. Several studies have identified changes in certain gait parameters as independent predictors of fall risk. Such gait changes are often too discrete to be detected by clinical observation alone. At the Basel Mobility Center, we employ the GAITRite electronic walkway system for spatial-temporal gait analysis. Although we have a large range of indications for gait analyses and several areas of clinical research, our focus is on the association between gait and cognition. Gait analysis with walking as a single-task condition alone is often insufficient to reveal underlying gait disorders present during normal, everyday activities. We use a dual-task paradigm, walking while

simultaneously performing a second cognitive task, to assess the effects of divided attention on motor performance and gait control. Objective quantification of such clinically relevant gait changes is necessary to determine fall risk. Early detection of gait disorders and fall risk permits early intervention and, in the best-case scenario, fall prevention. We and others have shown that rhythmic movement training such as Jaques-Dalcroze eurhythmics, tai chi and social dancing can improve gait regularity and automaticity, thus increasing gait safety and reducing fall risk.

Bula, C. J., S. Monod, et al. "Interventions Aiming at Balance Confidence Improvement in Older Adults: An Updated Review." *Gerontology*.

Background: Loss of balance confidence is a frequent condition that affects 20-75% of community-dwelling older persons. Although a recent fall is a common trigger, loss of balance confidence also appears independent of previous experience with falls. Maintaining or improving balance confidence is important to avoid unnecessary, self-imposed restrictions of activity and subsequent disability. Holding another person's hand or using an assistive device while walking are simple interventions that are used naturally to address poor balance confidence in daily life. However, more complex interventions have also been developed and tested to achieve more sustained improvement in balance confidence. Objectives: This review describes interventions that have been tested to improve balance confidence in older community-dwelling persons. Methods: Based on 2 recent systematic reviews, an additional search for literature was performed to update current information on interventions aiming at balance confidence improvement. Interventions were classified as those directly aimed at increasing balance confidence or not, and further stratified into those using monofactorial or multifactorial approaches. Results: A total of 46 randomized controlled trials were identified. Five of the 8 interventions that directly targeted balance confidence showed benefits. Among those, multicomponent behavioral group interventions provided the most robust evidence of benefits in improving balance confidence and in decreasing activity avoidance. Among interventions not directly aiming at balance confidence improvement (11/21 studies with benefits), exercise (including tai chi) appears as the most promising monofactorial intervention. Nine of the 17 multifactorial fall prevention programs showed an effect on balance confidence, exercise being a main component in 7 of these 9 studies. Interventions that targeted elderly persons reporting poor balance confidence and/or those at risk for falls seemed more likely to be beneficial. Conclusions: Positive and sometimes sustained improvement in balance confidence can be achieved by various interventions among community-dwelling elderly persons. The effect of these interventions on activity restriction associated with poor balance confidence have been less well studied, but some studies also suggest potential benefits.

Campbell, A. J. and M. C. Robertson "Comprehensive approach to fall prevention on a national level: New Zealand." *Clin Geriatr Med* 26(4): 719-31.

Individual assessment and treatment are important for older people at high risk of falls and injury. But falls are common. The problem cannot be addressed solely on an individual patient, individual clinician basis. Fall prevention programs that have broad coverage, good uptake and

adherence, and can be seen to maintain independent living benefit individuals and help control health service costs. Two such programs have been successfully introduced in New Zealand: the home-based Otago Exercise Programme and tai chi classes. The difficulty now is in maintaining the nationwide commitment to these preventive measures.

Chang, R. Y., M. Koo, et al. "Effects of Tai Chi on adiponectin and glucose homeostasis in individuals with cardiovascular risk factors." *Eur J Appl Physiol* 111(1): 57-66.

The aim of this study was to evaluate the acute effect of a single bout of Tai Chi (TC) exercise on adiponectin and glucose homeostasis in individuals with cardiovascular risk factors. Twenty-six individuals (mean age 60.2 years) with at least one cardiovascular risk factor who had been practicing Yang's style TC exercise for at least 3 months were recruited from a regional hospital in Taiwan. A one-group repeated measured quasi-experimental design was used. Participants completed a 60-min Yang's style TC exercise routine including warm up, stretching exercises, and TC followed by a 30-min resting period. After a 1-week washout period, the same group of participants underwent a control condition in which they were instructed to remain seated for 90 min at the study location. Blood samples were collected both before and after the TC intervention or the sitting condition. The difference between pre-post measurements for adiponectin was 0.58 +/- 1.42 mug/ml in the TC trial and -0.46 +/- 0.99 mug/ml in the sitting trial. The differences between the two trials were statistically significant ( $P = 0.004$ ). The changes from pretrial to posttrial were significantly greater for glycerol ( $P < 0.001$ ), cholesterol ( $P = 0.046$ ), and LDL-C ( $P = 0.038$ ) in the TC trial compared with those in the sitting trial. Conversely, the changes were significantly lesser for HOMA-IR ( $P = 0.004$ ), log (HOMA-IR) ( $P = 0.001$ ), and glucose ( $P = 0.003$ ) in TC trial compared with those in the sitting trial. In conclusion, a single bout of TC exercise had a significant positive effect on blood adiponectin concentrations in individuals with cardiovascular risk factors.

Chang, R. Y., M. Koo, et al. "Effects of Tai Chi rehabilitation on heart rate responses in patients with coronary artery disease." *Am J Chin Med* 38(3): 461-72.

The objective of the present study was to evaluate the effect of a six-month Tai Chi (TC) exercise cardiac rehabilitation program on two prognostic factors of cardiac events, rate-pressure product and rate-pressure product reserve, in patients with coronary artery disease (CAD). Patients ( $N = 54$ ) with CAD were recruited from the clinics of cardiology and cardiovascular surgery at a regional hospital in Taiwan. Twenty-two of them enrolled in the TC rehabilitation program which consisted of weekly 90-min sessions of Yang's style TC for six months in addition to receiving usual care. The remaining 32 patients received usual care only. Modified Bruce treadmill exercise test was performed to evaluate their exercise test responses at baseline and at six months. The change over time was significantly different between the TC and control group in peak rate-pressure product (RPP) (interaction between group and time,  $p = 0.029$ ) and in RPP reserve (interaction between group and time  $p = 0.009$ ) over the six-month period, there was a decrease in peak RPP of 32.0 mmHg x bpm x 10<sup>(-2)</sup> and in RPP reserve of 37.4 mmHg x bpm x 10<sup>(-2)</sup> in the TC group. In conclusion, participating in a six-month TC exercise-based

cardiac rehabilitation program was associated with improved peak RPP and RPP reserve during exercise testing in patients with CAD. TC exercise program may lead to a better prognosis for cardiac events in patients with CAD.

Chang, Y. K., Y. H. Nien, et al. "Physical activity and cognition in older adults: the potential of Tai Chi Chuan." *J Aging Phys Act* 18(4): 451-72.

The purpose of this article is to review the potential of Tai Chi Chuan as a mode of physical activity that could have cognitive benefits for older adults and to provide potential directions for future research. A brief introduction to Tai Chi Chuan and its related physical benefits is provided. In addition, the empirical literature related to Tai Chi Chuan and cognition is reviewed. Potential mediators of the relationship between Tai Chi Chuan and cognition, including physical resources, disease status, and mental resources, are discussed. Based on the limitations of the extant literature, it is argued that future research in this area must provide more detailed descriptions of Tai Chi Chuan, particularly in terms of intensity and program progression. Consideration of the specific type of cognition that is expected to benefit is also encouraged, and approaches for further efforts to understand how Tai Chi Chuan affects cognition are recommended.

Chen, H. C., K. Y. Cheng, et al. "The defence technique in Tai Chi Push Hands: A case study." *J Sports Sci*: 1-10.

Developed from traditional Chinese martial arts, Tai Chi exercise includes different forms and interactive Push Hands but biomechanical analyses have focused on the former only. To analyse the techniques of Push Hands, an experienced master was asked to defend pushing by four opponents. Movements were videotaped and digitized using a motion analysis system. Surface electrodes were used to record the electromyographic activity of ten muscle groups. Two force plates were used to measure the ground reaction force on each foot. Inexperienced individuals performed the same procedure to serve as the control group. The results indicate that the master adopted a postural adjustment to maintain balance. A clear shift of body weight from the front to the rear foot and mediolateral displacement of the centre of gravity was observed. Low electromyographic activity was observed in the upper body muscle groups, while high electromyographic activity was observed in the right rectus femoris and very high activity in the left rectus femoris during the defence. All inexperienced participants lost their balance in resisting pushing. It is concluded that the Tai Chi defensive technique includes a subtle postural adjustment that slightly changes the pushing force direction, and allows the rear leg to resist the incoming force.

Chiang, J., Y. Y. Chen, et al. "Tai Chi Chuan increases circulating myeloid dendritic cells." *Immunol Invest* 39(8): 863-73.

Dendritic cells, the most potent antigen-presenting cells linking innate and adoptive immunity, are thought to be important targets of immune modulators such as exercise. We examined the effect of Tai Chi Chuan (TCC) on dendritic cells. TCC practitioners were further divided to high-level practitioners (TCC-H) and low-level practitioners (TCC-L). The quantities of myeloid and plasmacytoid dendritic cells were estimated by flow cytometry. We examined parameters including age, body weight, body

length, body fat, and serum albumin level, in the controls, TCC-H and TCC-L, which did not differ significantly. The mean peak VO<sub>2</sub> (volume of O<sub>2</sub> utilization) of the TCC-H group was greater than that of the sedentary control group. White blood cell (WBC) count in the entire TCC group was greater than that of the controls. The quantity of myeloid dendritic cells was significantly greater in the TCC group, whereas the quantity of plasmacytoid dendritic cells was similar for both groups. Among the TCC subgroups, the quantity of myeloid dendritic cells, but not plasmacytoid dendritic cells, in the TCC-H group was greater than that of TCC-L practitioners. TCC could increase the number of circulating myeloid dendritic cells, but not plasmacytoid dendritic cells, in a performance level-dependent manner.

Chyu, M. C., C. R. James, et al. "Effects of tai chi exercise on posturography, gait, physical function and quality of life in postmenopausal women with osteopaenia: a randomized clinical study." *Clin Rehabil* 24(12): 1080-90.

OBJECTIVE: to evaluate the effects of tai chi exercise on risk factors for falls in postmenopausal women with osteopaenia through measurements of balance, gait, physical function and quality of life. DESIGN: a randomized, controlled, single-blinded, 24-week trial with stratification by age and bone mass. SETTING: general community. Participants: Sixty-one independently living elderly females aged 65 years and older with low bone mass. INTERVENTIONS: subjects were recruited and randomly assigned to 24 weeks of tai chi (60 minutes/session, three sessions/week, n = 30) or a control group (n = 31). OUTCOME MEASURES: computerized dynamic posturography, gait, 'timed up and go', five-chair sit-to-stand and quality of life assessed at baseline, 12 and 24 weeks. RESULTS: after 24 weeks, subjects in the tai chi group demonstrated an increase in stride width (P = 0.05) and improvement in general health (P = 0.008), vitality (P = 0.02) and bodily pain (P = 0.03) compared with those in the control group. There was no significant difference in balance parameters, 'timed up and go', five-chair sit-to-stand and other domains of quality of life. CONCLUSION: tai chi exercise may reduce risk factors for falls by increasing the stride width, and may improve quality of life in terms of general health, vitality and bodily pain in postmenopausal women with osteopaenia.

Day, L., C. F. Finch, et al. "Modelling the population-level impact of tai-chi on falls and fall-related injury among community-dwelling older people." *Inj Prev* 16(5): 321-6.

OBJECTIVE: To model the population level impact of tai-chi on future rates of falls and fall-related injury in older people as a tool for policy development. DESIGN: An epidemiological and economic model for estimating population-level effectiveness of tai-chi. SETTING: Australia, 2009. Patients or subjects Australian community-dwelling population aged 70+ years, ambulatory and without debilitating conditions or profound visual defects. Intervention Group-based tai-chi, for 1 h twice weekly for 26 weeks, assuming no sustained effect beyond the intervention period. Main outcome measure Total falls and fall-related hospitalisation prevented in 2009. RESULTS: Population-wide tai-chi delivery would prevent an estimated 5440 falls and 109 fall-related hospitalisations, resulting in a 0.18% reduction in the fall-related hospital admission rate for community-dwelling older people. The gross costs per fall and

per fall-related hospital admission prevented were \$A4414 (euro3013) and \$A220,712 (euro150,684), respectively. A total investment of \$A24.01 million (euro16.39 million), equivalent to 4.2% of the cost of fall-related episodes of hospital care in 2003/4, would be required to provide tai-chi for 31,998 people and achieve this effect. CONCLUSIONS: Substantial investment in, and high population uptake of, tai-chi would be required to have a large effect on falls and fall-related hospitalisation rates. Although not accounted for in this study, investment in tai-chi is likely to be associated with additional significant health benefits beyond falls prevention. This approach could be applied to other interventions to assist selection of the most cost-effective falls-prevention portfolio for Australia and other countries.

Dhanani, N. M., T. J. Caruso, et al. "Complementary and Alternative Medicine for Pain: An Evidence-based Review." *Curr Pain Headache Rep.*

Pain is one of the most prevalent conditions for which patients seek medical attention. Additionally, the number of patients who utilize complementary and alternative medicine as a treatment of pain either in lieu of, or concurrent with, standard conventional treatments continues to grow. While research into the mechanisms, side effect profiles, and efficacies of these alternative therapies has increased in recent years, much more remains unknown and untested. Herein, we review the literature on complementary and alternative medicine for pain, with particular emphasis on evidence-based assessments pertinent to the most common alternative therapies, including acupuncture, herbal therapy, massage therapy, hypnosis, tai chi, and biofeedback.

Elkins, G., W. Fisher, et al. "Mind-body therapies in integrative oncology." *Curr Treat Options Oncol* 11(3-4): 128-40.

There is growing interest in mind-body therapies as adjuncts to mainstream cancer treatment, and an increasing number of patients turn to these interventions for the control of emotional stress associated with cancer. Increased research funding has enabled many such interventions to be evaluated for their efficacy, including studies of mind-body interventions to reduce pain, anxiety, insomnia, anticipatory, and treatment-related nausea, hot flashes, and improved mood. Mind-body treatments evaluated for their utility in oncology include relaxation therapies, biofeedback, meditation and hypnosis, yoga, art and music therapy, tai chi, and qigong. Although studies are not always methodologically sound and results mixed, a growing number of well-designed studies provide convincing evidence that mind-body techniques are beneficial adjuncts to cancer treatment. The evidence is sufficient to recommend further investigation and adoption of these techniques in mainstream oncology care.

Escalante, Y., A. Garcia-Hermoso, et al. "Effects of exercise on functional aerobic capacity in lower limb osteoarthritis: A systematic review." *J Sci Med Sport.*

Osteoarthritis (OA) is a degenerative joint disease. The reduced aerobic capacity of patients with lower limb osteoarthritis affects their independence in performing everyday activities. The purpose of this systematic review was to summarize evidence for the effectiveness and structure of exercise programs on functional aerobic capacity (ability to perform activities of daily living that require sustained aerobic

metabolism) in patients with hip and knee osteoarthritis. A computerized search was made of seven databases. Effect sizes (ES) and 95% confidence intervals (CI) were calculated, and the heterogeneity of the studies was assessed using Cochran's Q statistic applied to the ES means. The 20 studies that satisfied the inclusion criteria were selected for analysis. These studies were grouped into five categories according to the characteristics of the exercise program: land-based interventions (strength programs, tai chi, aerobic programs, mixed exercise programs) and aquatic intervention (hydrotherapy). The functional aerobic capacity improved in tai chi programs (ES=0.66; 95% CI, 0.23-1.09), aerobic programs (ES=0.90; 95% CI, 0.70-1.10), and mixed programs (ES=0.47; 95% CI, -0.38-0.39). The conclusions were: (i) despite recommendations for the use of exercise programs for aerobic fitness in patients with hip and knee osteoarthritis, few randomized clinical trials have been conducted; (ii) the structure of the exercise programs (program content and duration, and session frequency and duration) is very heterogeneous; (iii) overall, exercise programs based on tai chi, aerobic, and mixed exercise seem to give better results than hydrotherapy programs, but without the differences being altogether clear.

Escalante, Y., J. M. Saavedra, et al. "Physical exercise and reduction of pain in adults with lower limb osteoarthritis: a systematic review." *J Back Musculoskelet Rehabil* 23(4): 175-86.

Osteoarthritis is a degenerative joint disease. The knee and hip joints are the most frequently affected. Treatments fall into three main categories: pharmacological, non-pharmacological, and surgical. Treatments can be applied alone or in combination. In the last few years, within the non-pharmacological category have been a growing importance of physical exercise programs aimed to reduce pain in knee and hip joints. The purpose of this review was to summarize evidence for the effectiveness and structure of exercise programs on pain in patients with hip and knee osteoarthritis. To that end, several databases were searched, retrieving 33 studies that evaluated the influence of different exercise programs on pain. These studies were grouped according to the characteristics of the exercise program: land-based intervention (strength program, Tai Chi, aerobic program), aquatic intervention (hydrotherapy), and mixed exercise programs. The main conclusions drawn were: (i) despite recommendations for the use of exercise programs as pain therapy in patients with hip and knee osteoarthritis, very few randomized clinical studies were conducted; (ii) the structure of the exercise programs (content, duration, frequency and duration of the session) is very heterogeneous; (iii) on overall, exercise programs based on Tai Chi have better results than mixed exercise programs, but without clear differences.

Field, T., M. Diego, et al. "Tai chi/yoga effects on anxiety, heartrate, EEG and math computations." *Complement Ther Clin Pract* 16(4): 235-8.

OBJECTIVE: To determine the immediate effects of a combined form of Tai chi/yoga. DESIGN: 38 adults participated in a 20-min Tai chi/yoga class. The session was comprised of standing Tai chi movements, balancing poses and a short Tai chi form and 10 min of standing, sitting and lying down yoga poses. MAIN OUTCOME MEASURES: The pre- and post- Tai chi/yoga effects were assessed using the State Anxiety Inventory (STAI), EKG, EEG and math computations. RESULTS: Heartrate increased during the session,

as would be expected for this moderate-intensity exercise. Changes from pre to post-session assessments suggested increased relaxation including decreased anxiety and a trend for increased EEG theta activity. CONCLUSIONS: The increased relaxation may have contributed to the increased speed and accuracy noted on math computations following the Tai chi/yoga class.

Gill, A., R. Womack, et al. "Clinical Inquiries: Does exercise alleviate symptoms of depression?" J Fam Pract 59(9): 530-1.

Yes. Exercise reduces patient-perceived symptoms of depression when used as monotherapy (strength of recommendation [SOR]: B, meta-analysis of randomized controlled trials [RCTs] with significant heterogeneity). It relieves symptoms as effectively as cognitive behavioral therapy (CBT) or pharmacologic anti-depressant therapy (SOR: B, meta-analysis) and more effectively than bright light therapy (SOR: B, meta-analysis). Resistance exercise and mixed exercise (resistance and aerobic) work better than aerobic exercise alone (SOR: B, meta-analysis). High-frequency exercise is more effective than low-frequency exercise (SOR: B, small RCT). "Mindful" exercise, which has a meditative focus, such as tai chi and yoga, also reduces symptoms of depression (SOR: B, systematic review of RCTs).

Gillum, F. and D. M. Griffith "Prayer and spiritual practices for health reasons among American adults: the role of race and ethnicity." J Relig Health 49(3): 283-95.

Many studies find racial differences in prayer and religious practices, but few reports examine factors that help explain the effects of Hispanic ethnicity or African American race. A national survey conducted in 2002 collected data on 10 non-religious spiritual practices as well as on prayer for health reasons in 22,929 adults aged 18 years and over. We found marked racial and ethnic differences in the use of prayer and other spiritual practices for health reasons. Greater proportions of African Americans and Hispanic Americans than European Americans reported prayer for health reasons. Sociodemographic variables and health status could not explain these differences. Further, among those who reported prayer, African Americans were more likely than European Americans to report being prayed for by others. However, African American women and Hispanic women and men were significantly less likely than European Americans to use other spiritual practices such as meditation and Tai Chi. Surprisingly African American men were just as likely to report these practices as European American men. Sociodemographic variables and health status could not explain these differences.

Hasegawa-Ohira, M., M. Toda, et al. "[Effects of Tai Chi exercise on physical and mental health]." Nippon Eiseigaku Zasshi 65(4): 500-5.

Recently, Tai Chi, which is one of the Chinese traditional martial arts, has been receiving attention. The main feature of Tai Chi is its flowing movements including loosening up, relaxing, and practicing meditation with slow abdominal respiration. Tai Chi is widely taken as part of health-promotion activities or rehabilitation training, and significant mental and physical effects have been reported so far. In this review report, Tai Chi was confirmed to be beneficial not only as a rehabilitation training for old people or patients with various diseases



but also as an exercise for healthy people. These findings suggest the potential of Tai Chi as a complementary and alternative therapy.

Jahnke, R., L. Larkey, et al. "A comprehensive review of health benefits of qigong and tai chi." *Am J Health Promot* 24(6): e1-e25.

OBJECTIVE: Research examining psychological and physiological benefits of Qigong and Tai Chi is growing rapidly. The many practices described as Qigong or Tai Chi have similar theoretical roots, proposed mechanisms of action, and expected benefits. Research trials and reviews, however, treat them as separate targets of examination. This review examines the evidence for achieving outcomes from randomized controlled trials (RCTs) of both. DATA SOURCES: The key words Tai Chi, Taiji, Tai Chi Chuan, and Qigong were entered into electronic search engines for the Cumulative Index for Allied Health and Nursing (CINAHL), psychological literature (PsycINFO), PubMed, Cochrane database, and Google Scholar. STUDY INCLUSION CRITERIA: RCTs reporting on the results of Qigong or Tai Chi interventions and published in peer-reviewed journals from 1993 to 2007. DATA EXTRACTION: Country, type and duration of activity, number/type of subjects, control conditions, and reported outcomes were recorded for each study. SYNTHESIS: Outcomes related to Qigong and Tai Chi practice were identified and evaluated. RESULTS: Seventy-seven articles met the inclusion criteria. The nine outcome category groupings that emerged were bone density (n = 4), cardiopulmonary effects (n = 19), physical function (n = 16), falls and related risk factors (n = 23), quality of life (n = 17), self-efficacy (n = 8), patient-reported outcomes (n = 13), psychological symptoms (n = 27), and immune function (n = 6). CONCLUSIONS: Research has demonstrated consistent, significant results for a number of health benefits in RCTs, evidencing progress toward recognizing the similarity and equivalence of Qigong and Tai Chi.

Jahnke, R. A., L. K. Larkey, et al. "Dissemination and benefits of a replicable Tai Chi and Qigong program for older adults." *Geriatr Nurs* 31(4): 272-80.

Tai Chi and Qigong (TCQG) show promise for improving many health outcomes and are recommended for dissemination to older adults. A simplified, easy-to-replicate version of TCQG, "Tai Chi Easy," was tested using a train-the-trainer method to demonstrate feasibility of dissemination to a widespread population of older adults through community sites and achievement of perceived outcomes. Nonexpert facilitators known as "practice leaders" were trained to implement Tai Chi Easy sessions at 18 sites across the United States. Outstanding facilitator (100%) and participant (94%) adherence was achieved. With 330 completers, mean age 73 years, significant improvements were found for participants' perceived stress levels (P = .003). Sleep quality and energy/vitality were markedly improved. Eighty-nine percent enjoyed the program, 91% were committed to continue, and 67% stated that they had increased their weekly levels of physical activity. A train-the-facilitator model for Tai Chi Easy is easily disseminated to older adults and may promote a sustainable alternative exercise, yielding favorable quality of life benefits.

Lam, L. C., R. C. Chau, et al. "Interim follow-up of a randomized controlled trial comparing Chinese style mind body (Tai Chi) and

stretching exercises on cognitive function in subjects at risk of progressive cognitive decline." *Int J Geriatr Psychiatry*.

**OBJECTIVES:** We reported the interim findings of a randomized controlled trial (RCT) to examine the effects of a mind body physical exercise (Tai Chi) on cognitive function in Chinese subjects at risk of cognitive decline. **SUBJECTS:** 389 Chinese older persons with either a Clinical Dementia Rating (CDR 0.5) or amnesic-MCI participated in an exercise program. The exercise intervention lasted for 1 year; 171 subjects were trained with 24 forms simplified Tai Chi (Intervention, I) and 218 were trained with stretching and toning exercise (Control, C). The exercise comprised of advised exercise sessions of at least three times per week. **RESULTS:** At 5th months (2 months after completion of training), both I and C subjects showed an improvement in global cognitive function, delayed recall and subjective cognitive complaints (paired t-tests,  $p < 0.05$ ). Improvements in visual spans and CDR sum of boxes scores were observed in I group (paired t-tests,  $p < 0.001$ ). Three (2.2%) and 21(10.8%) subjects from the I and C groups progressed to dementia (Pearson chi square = 8.71, OR = 5.34, 95% CI 1.56-18.29). Logistic regression analysis controlled for baseline group differences in education and cognitive function suggested I group was associated with stable CDR (OR = 0.14, 95%CI = 0.03-0.71,  $p = 0.02$ ). **CONCLUSIONS:** Our interim findings showed that Chinese style mind body (Tai Chi) exercise may offer specific benefits to cognition, potential clinical interests should be further explored with longer observation period. Copyright (c) 2010 John Wiley & Sons, Ltd.

Lee, M. S., E. N. Lee, et al. "Tai chi for lowering resting blood pressure in the elderly: a systematic review." *J Eval Clin Pract* 16(4): 818-24.

**OBJECTIVES:** To assess the evidence for tai chi in reducing resting blood pressure (BP) in the elderly. **METHODS:** Databases were searched up to February 2009. All randomized clinical trials (RCTs) testing the effects of tai chi on resting BP in the elderly were considered. The selection of studies, data extraction and validation were performed independently by two reviewers. Methodological quality was evaluated using the Jadad score. **RESULTS:** A total of 329 potentially relevant articles were identified and four RCTs met the inclusion criteria. One study suggested a significant BP reduction compared with no treatment or wellness education programme, while the others showed no effects compared with resistance exercise and usual activity. Two RCTs failed to show a reduction of resting BP compared with aerobic exercise, low impact exercise and no exercise control. **CONCLUSION:** The evidence for tai chi in reducing BP in the elderly individuals is limited. Whether tai chi has benefits over exercise is still unclear. The number of trials and the total sample size are too small to draw any firm conclusions. Further rigorous RCTs are warranted.

Leung, R. W., J. A. Alison, et al. "A study design to investigate the effect of short-form Sun-style Tai Chi in improving functional exercise capacity, physical performance, balance and health related quality of life in people with Chronic Obstructive Pulmonary Disease (COPD)." *Contemp Clin Trials*.

The effectiveness of exercise training in people with COPD is well established. However, alternative methods of training such as Tai Chi

have not been widely evaluated. This paper describes the study design of a clinical trial which aims to determine if short form Sun-style Tai Chi improves exercise capacity and quality of life in people with COPD. Method: This randomised controlled trial will be conducted with concealed allocation and blinded outcome assessment. Participants will be recruited from Concord Repatriation General Hospital, Sydney. After baseline measurement, participants will be randomised into either a Tai Chi Group or a Control Group. Participants in the Tai Chi Group will undergo supervised training twice weekly for twelve weeks. Participants in the Control Group will undergo usual medical care. Measurements will be taken at baseline (week 0) and after the study period (week 12). The primary outcome measurement is endurance walking capacity assessed by the endurance shuttle walk test. Secondary outcomes include measures related to peak walking capacity, physical performance, balance, muscle strength and quality of life. Details of the physiological responses during Tai Chi will be collected in a small cohort to determine the training intensity of Sun-style Tai Chi. Discussion: If short form Sun-style Tai Chi improves exercise capacity, physical performance and quality of life in people with COPD, this would provide an alternate form of exercise training which does not require exercise equipment thus making effective exercise training more accessible for the large numbers of people with COPD.

Li, L. and B. Manor "Long term Tai Chi exercise improves physical performance among people with peripheral neuropathy." *Am J Chin Med* 38(3): 449-59.

This study examined the effects of a 24-week Tai Chi intervention on physical function in individuals with peripheral neuropathy. Twenty-five women and men with peripheral neuropathy were recruited. Plantar pressure detection threshold was assessed with a 5.07 gauge monofilament. Functional gait was assessed by the 6-min walk and timed up-and-go tests. Isokinetic leg strength and standing balance was also assessed. Twenty-four consecutive weeks of modified, group-based Tai Chi practice was completed, with testing repeated every six weeks throughout. No adverse events were observed and attendance was 17 +/- 4 sessions per 6 weeks. After 6 weeks of Tai Chi, participants increased 6-min walk ( $P < 0.0001$ ), timed up-and-go ( $P < 0.0001$ ), and leg strength ( $P < 0.01$ ) performance. Continued improvement was observed in the timed up-and-go. Plantar sensation improved ( $P = 0.003$ ) following the Tai Chi intervention. Group-based Tai Chi is a safe, plausible, and effective intervention for those with PN.

Liu, H. and A. Frank "Tai chi as a balance improvement exercise for older adults: a systematic review." *J Geriatr Phys Ther* 33(3): 103-9.

PURPOSE: The purpose of this systematic review was to identify exercise parameters and the most common outcome measures used in tai chi (TC) research. METHODS: Ovid Medline and PubMed were used to identify longitudinal studies published from January 2000 to July 2007 written in English with the key words tai chi, tai ji, tai chi quan, tai ji quan, balance, falls, and falling. Qualifying studies had subjects aged 60 years or older. RESULTS: In all 19 qualified prospective studies, older vigorous and likely transitional frail individuals seemed to benefit more from TC than did older frail individuals. The most commonly used TC parameters were Yang's style, with 12 or fewer forms, durations of 12

weeks or longer, frequencies of twice a week or more, and session lengths of at least 45 minutes. The most common outcome measures observed were a combination of 2 to 5 of the following 10 measures (from most to least common): fear of falling, single-leg stance, posturography, rate of falling, flexibility, walking velocity, Berg Balance Scale, Timed up and Go, Functional Reach, and ankle and knee joint strength and range of motion. Improvements were reported in almost all of these measures. CONCLUSIONS: This review indicates that TC may be an economic and effective exercise program for improving balance and balance confidence in older adults.

Logghe, I. H., A. P. Verhagen, et al. "The effects of Tai Chi on fall prevention, fear of falling and balance in older people: a meta-analysis." *Prev Med* 51(3-4): 222-7.

OBJECTIVE: Tai Chi (TC) is an exercise training that is becoming increasingly popular as an intervention for single fall prevention. This meta-analysis was performed to evaluate the efficacy of TC on fall rate, fear of falling and balance in older people. METHODS: Randomized controlled trials published between 1988 and January 2009 were included. In the Netherlands (2009) we used random effects models for the analyses, with data reported as incidence rate ratios (IRR) for falls and standardized mean differences (SMD) for fear of falling and balance. RESULTS: Nine trials (representing 2203 participants) were included in the analyses. Compared with exercise controls, TC participants showed significant improvements in fall rates (2 trials included, IRR: 0.51, 95% CI 0.38-0.68) and static balance (2 trials included, SMD: 0.47, 95% CI 0.23-0.72). Compared with non-exercise controls, no improvement was found for TC participants in fall rates (5 trials, IRR: 0.79, 95% CI 0.60-1.03) or static balance (2 trials, SMD: 0.30, 95% CI -0.50-1.10), but a significant improvement was found for fear of falling (SMD: 0.37, 95% CI=0.03-0.70). CONCLUSIONS: Currently there is insufficient evidence to conclude whether TC is effective in fall prevention, decreasing fear of falling and improving balance in people over age 50 years.

Logghe, I. H., A. P. Verhagen, et al. "Explaining the ineffectiveness of a Tai Chi fall prevention training for community-living older people: A process evaluation alongside a randomized clinical trial (RCT)." *Arch Gerontol Geriatr*.

The results of a randomized clinical trial (RCT) on the effects of a Tai Chi fall prevention in community-living older people with a high risk of falling in the Netherlands showed no beneficial effects on falls and secondary outcomes (e.g., balance, fear of falling). The aim of this study is to provide insight in process-related factors that may have influenced the effectiveness of the intervention. The intervention consisted of Tai Chi Chuan (TCC) training for 1h twice a week for 13 weeks. We used self-administered questionnaires and registration forms to collect data from participants and instructors. We analyzed quantitative data by means of descriptive statistics and categorized qualitative data based on the content of the answers given. Of the participants, that started the program 89 (79%) completed the intervention, but a minority of 47% attended 80% of more of the lessons. All participants and instructors were positive about the program and most participants reported benefits from the intervention. Suggestions for improvements mainly relate to adjustments of training aspects. The main process-

related factors that may have influenced the lack of beneficial effects on falls and secondary outcomes are the relatively high withdrawal and the low adherence rates.

Nomura, T., K. Nagano, et al. "The development of a Tai Chi exercise regimen for the prevention of conditions requiring long-term care in Japan." *Arch Gerontol Geriatr*.

This study was to examine an effect of such an exercise program on preventing conditions requiring long-term care in the Japanese frail elderly who participated in a Tai Chi Yuttari-exercise program. The first-intervention group underwent an intervention program by participating in a Tai Chi Yuttari-exercise session once a week for 3 months. Each session lasted 90min including a break time. Moreover, the subjects received a video recording of the exercise, and instructions to carry out the exercise at home. The same program was administered to the second-intervention group. Physical function improved significantly in the first-intervention group, with single-leg balance (SLB) increasing, and trunk anteflexion increasing after the intervention program. Furthermore, the total score of the Motor Fitness Scale (MFS) improved significantly. On the other hand, mono- and multi-variate analyses showed no significant differences observed in the second-intervention group during the study period. A careful interpretation of the results suggests that Tai Chi Yuttari-exercise improves physical function and ability for frail elderly individuals and could reduce the need for long-term care.

Palumbo, M. V., G. Wu, et al. "Tai Chi for older nurses: A workplace wellness pilot study." *Appl Nurs Res*.

**PURPOSE:** The purpose of this pilot study was to assess the feasibility of a Tai Chi workplace wellness program as a cost effective way of improving physical and mental health, reducing work related stress, and improving work productivity among older nurses in a hospital setting. **DESIGN:** A randomized control trial of two groups (control and Tai Chi group). **DESIGN:** A randomized control trial of two groups (control and Tai Chi group). **SETTINGS:** Northeastern academic medical center. **SUBJECTS:** A convenience sample of eleven female nurses (mean age 54.4 years). **INTERVENTION:** The Tai Chi group (n = 6) was asked to attend Tai Chi classes once a week offered at their worksite and to practice on their own for 10 minutes each day at least 4 days per week for 15 weeks. Controls (n = 5) received no intervention. **MEASURES:** SF-36 Health Survey, Nursing Stress Scale (NSS), Perceived Stress Scale (PSS), Sit-and-Reach test, Functional Reach test, the Work Limitations Questionnaire, workplace injury and unscheduled time off. **ANALYSIS:** The two study groups were compared descriptively and changes across time in the intervention versus control were compared. **RESULTS:** The Tai Chi group took no unscheduled time-off hours, whereas, the control group was absent 49 hours during the study period. There was also a 3% increase in work productivity and significant improvement in functional reach (p=0.03) compared to the control group. Other outcomes were not statistically significant. **CONCLUSION:** This pilot study demonstrates the feasibility of Tai Chi with older female workers as a cost effective wellness option in the workplace; thus encouraging replication with a larger sample. Methodological implications were also addressed.

Peppone, L. J., K. M. Mustian, et al. "Effects of a structured weight-bearing exercise program on bone metabolism among breast cancer survivors: a feasibility trial." *Clin Breast Cancer* 10(3): 224-9.

**PURPOSE:** Treatments for breast cancer, specifically hormonal therapy, accelerate bone loss (BL) among breast cancer survivors, leading to osteoporosis and an increase in fracture risk. Tai Chi Chuan (TCC) is a moderate form of weight-bearing exercise, equivalent to walking, and it has been shown to improve aerobic capacity and strength among breast cancer survivors and might also be effective in slowing bone loss in breast cancer survivors. This pilot study compared the influence of TCC with that of standard support therapy (ST; exercise control) on BL biomarkers among breast cancer survivors. **PATIENTS AND METHODS:** Randomly assigned breast cancer survivors (N = 16; median age, 53 years; < 30 months after treatment) completed 12 weeks (3 times per week, 60 minutes per session) of TCC or ST. Serum levels of N-telopeptides of type I collagen (NTx), a marker of bone resorption, and bone-specific alkaline phosphatase (BSAP), a marker of bone formation, were determined according to enzyme-linked immunosorbent assay at baseline and after the intervention. **RESULTS:** Using analysis of covariance, survivors in the TCC group experienced a greater increase in levels of bone formation (BSAP [microg/L]: before, 8.3; after, 10.2; change, 1.9 microg/L and 22.4%), compared with survivors in ST (BSAP [microg/L]: before, 7.6; after, 8.1; change, 0.5 microg/L [6.3%]). Survivors in the TCC group also experienced a significant decrease in bone resorption (NTx [nanomoles bone collagen equivalent; nmBCE]: before, 17.6; after, 11.1; change, -6.5 nmBCE; -36.9%), whereas women in the ST group did not (NTx [nmBCE]: before, 20.8; after, 18.8; change, -2.0 nmBCE; -9.6%). **CONCLUSION:** This pilot study suggests that weight-bearing exercise exerts positive effects on BL, through increased bone formation and decreased bone resorption. Further examinations of the influence of TCC on bone health are warranted.

Sarris, J. and G. J. Byrne "A systematic review of insomnia and complementary medicine." *Sleep Med Rev.*

In concert with growing public interest in complementary and alternative medicine (CAM), these therapies and products have been increasingly studied over the past two decades for the treatment of sleep disorders. While systematic reviews have been conducted on acupuncture and valerian in the treatment of insomnia, to date no comprehensive review has been conducted on all major CAM treatments. We sought to address this via a rigorous systematic review of hypnotic CAM interventions, including herbal and nutritional medicine, acupuncture, acupressure, yoga, tai chi, massage, aromatherapy and homoeopathy. The electronic databases MEDLINE (PubMed), CINAHL, PsycINFO, and The Cochrane Library were accessed during late 2009 for CAM randomized controlled trials (RCTs) in the treatment of chronic insomnia. Sixty-four RCTs were identified, of which 20 studies involving eight CAM interventions met final inclusion criteria. Effect size calculations (where possible) and a quality control analysis using a modified Jadad scale were undertaken. Many RCTs lacked methodological rigor, and were commonly excluded due to small sample size or an inadequate control condition. Among the studies that met inclusion criteria, there was evidentiary support in the treatment of chronic insomnia for acupressure (d=1.42-2.12), tai chi (d=0.22-2.15), yoga (d=0.66-1.20), mixed evidence for acupuncture and L-tryptophan, and weak and unsupportive evidence for herbal medicines such

as valerian. Surprisingly, studies involving several mainstream CAM therapies (e.g., homoeopathy, massage, or aromatherapy) were not located or did not meet basic inclusion criteria. If CAM interventions are to be considered as viable stand-alone or adjuvant treatments for sleep disorders, future researchers are urged to use acceptable methodology, including appropriate sample sizes and adequate controls. RCTs evaluating other untested CAM therapies such as massage, homoeopathy, or osteopathy are encouraged, as is the exploration of using CAM therapies adjuvantly with conventional therapies.

Sato, S., S. Makita, et al. "Effect of Tai Chi training on baroreflex sensitivity and heart rate variability in patients with coronary heart disease." *Int Heart J* 51(4): 238-41.

Tai Chi is a traditional Chinese conditioning exercise that has been used to integrate slow movements, controlled breathing, and mental concentration. The aim of the study was to determine whether Tai Chi training in addition to cardiac rehabilitation would result in a shift toward increased vagal activity of autonomic markers, such as baroreflex sensitivity (BRS) and heart rate variability (HRV). Twenty patients with coronary heart disease (CHD) (male/female: 13/7, mean age: 67.8 +/- 4.2 years, mean interval time after a coronary event: 19.8 months) completed this study. The Tai Chi group (n = 10) practiced supervised Tai Chi training once a week and home-based Tai Chi training three times a week together with conventional cardiac rehabilitation for one-year. The control group (n = 10) conducted the conventional cardiac rehabilitation only. BRS and HRV were evaluated at the baseline and after one-year of Tai Chi training. Compared with the controls, patients in the Tai Chi group showed statistically significant improvement in BRS (P = 0.036). These associations persisted after adjustment for age and other covariates. On the other hand, there were no significant trends seen in HRV. Additional Tai Chi training during cardiac rehabilitation may augment reflex vagal regulation, which adds importantly to knowledge of cardiac rehabilitation on autonomic regulation and clinical management of CHD.

Schumacher, H. R. "Tai Chi improves physical function in older Chinese women with knee osteoarthritis: retraction." *J Clin Rheumatol* 16(7): 357.

Shen, C. L., M. C. Chyu, et al. "Green tea polyphenols supplementation and Tai Chi exercise for postmenopausal osteopenic women: safety and quality of life report." *BMC Complement Altern Med* 10: 76.

ABSTRACT: BACKGROUND: Evidence suggests that both green tea polyphenols (GTP) and Tai Chi (TC) exercise may benefit bone health in osteopenic women. However, their safety in this population has never been systematically investigated. In particular, there have been hepatotoxicity concerns related to green tea extract. This study was to evaluate the safety of 24 weeks of GTP supplementation combined with TC exercise in postmenopausal osteopenic women, along with effects on quality of life in this population. METHODS: 171 postmenopausal women with osteopenia were randomly assigned to 4 treatment arms for 24 weeks: (1) Placebo (500 mg starch/day), (2) GTP (500 mg GTP/day), (3) Placebo + TC (placebo plus TC training at 60 min/session, 3 sessions/week), and (4) GTP + TC (GTP plus TC training). Safety was examined by assessing liver enzymes (aspartate aminotransferase, alanine aminotransferase), alkaline

phosphatase, and total bilirubin at baseline and every 4 weeks. Kidney function (urea nitrogen and creatinine), calcium, and inorganic phosphorus were also assessed at the same times. Quality of life using SF-36 questionnaire was evaluated at baseline, 12, and 24 weeks. A mixed model of repeated measures ANOVA was applied for analysis. RESULTS: 150 subjects completed the study (12% attrition rate). The compliance rates for study agents and TC exercise were 89% and 83%, respectively. Neither GTP supplementation nor TC exercise affected liver or kidney function parameters throughout the study. No adverse event due to study treatment was reported by the participants. TC exercise significantly improved the scores for role-emotional and mental health of subjects, while no effect on quality of life was observed due to GTP supplementation. CONCLUSIONS: GTP at a dose of 500 mg/day and/or TC exercise at 3 hr/week for 24 weeks appear to be safe in postmenopausal osteopenic women, particularly in terms of liver and kidney functions. TC exercise for 24 weeks (3 hr/wk) significantly improved quality of life in terms of role-emotional and mental health in these subjects. ClinicalTrials.gov identifier: NCT00625391.

Simic, M., R. S. Hinman, et al. "Gait modification strategies for altering medial knee joint load: A systematic review." *Arthritis Care Res (Hoboken)*.

OBJECTIVE:: To evaluate the effect of gait modification strategies on the external knee adduction moment (KAM), a marker of medial knee joint load; determine potentially adverse effects; assess the methodological quality; and identify areas of future research. METHODS:: Five electronic databases were searched. Studies evaluating the effects of gait modifications on the KAM in either healthy or knee OA individuals were included. Methodological quality was evaluated by two reviewers using the Downs and Black checklist. RESULTS:: Twenty-four studies met inclusion criteria, exploring 14 different gait modifications of varying sample sizes, age groups and OA classifications. Contralateral cane use, increased step width, medial knee thrust, increased hip internal rotation, weight transfer to the medial foot and increased lateral trunk lean demonstrated KAM reductions. Tai-Chi gait, ipsilateral cane use, Nordic walking poles and increased knee flexion exhibited increases in the KAM, demonstrating a potential detriment with their use. The effects of reduced stride length, as well as increases and reductions in either toe-out or gait speed were inconsistent across the studies and gait cycle. CONCLUSIONS:: This review demonstrates that some gait modifications have the ability to alter knee load. Future research is required to determine the magnitude of modification required to maximise beneficial effects, best method of training, long-term patient adherence and if these biomechanical changes can translate into clinically relevant changes in symptoms or disease progression risk.

Tai, H. C., S. D. Chung, et al. "Metabolic syndrome components worsen lower urinary tract symptoms in women with type 2 diabetes." *J Clin Endocrinol Metab* 95(3): 1143-50.

Context: Diabetic women are more susceptible to develop lower urinary tract symptoms (LUTS), especially overactive bladder (OAB). However, data regarding the effect of components of metabolic syndrome (MS) on this association are conflicting. Objective: The objective of the study was to examine the potential role of MS in the development of LUTS



in diabetic women. Design: The study was a prevalence study conducted between 2005 and 2007. Setting: The study was conducted in a university hospital. Participants: A total of 518 women with type 2 diabetes aged 50-75 yr were included. They were subgrouped as MS (47.5%) and non-MS (52.5%) groups according to whether they fulfilled the criteria of MS. Main Outcome Measure: We used American Urological Association Symptom Index (AUA-SI) to evaluate LUTS and Indevus Urgency Severity Scale to evaluate OAB, respectively. Results: Women in the MS group had significantly higher storage and total AUA-SI scores as well as a higher prevalence of LUTS and OAB. Most intriguingly, the number of MS components was strongly associated with the LUTS severity because the AUA-SI scores increased in parallel to the number of components were present. Similar results were found between MS and OAB. Multivariate analysis revealed that peripheral neuropathy, but not MS, significantly predicted LUTS in diabetic women after age adjustment. However, MS remained significantly predictive for LUTS and OAB after additional adjustment for neuropathy. Conclusions: Our results suggest that MS may especially influence LUTS and OAB in diabetic women, probably by compounding the effect of peripheral neuropathy.

Taylor-Piliae, R. E., K. A. Newell, et al. "Effects of Tai Chi and Western exercise on physical and cognitive functioning in healthy community-dwelling older adults." *J Aging Phys Act* 18(3): 261-79.

OBJECTIVE: To compare the effects of Tai Chi (TC, n = 37) and Western exercise (WE, n = 39) with an attention-control group (C, n = 56) on physical and cognitive functioning in healthy adults age 69 +/- 5.8 yr, in a 2-phase randomized trial. METHODS: TC and WE involved combined class and home-based protocols. Physical functioning included balance, strength, flexibility, and cardiorespiratory endurance. Cognitive functioning included semantic fluency and digit-span tests. Data were analyzed using intention-to-treat analysis. RESULTS: At 6 mo, WE had greater improvements in upper body flexibility (F = 4.67, p = .01) than TC and C. TC had greater improvements in balance (F = 3.36, p = .04) and a cognitive-function measure (F = 7.75, p < .001) than WE and C. The differential cognitive-function improvements observed in TC were maintained through 12 mo. CONCLUSION: The TC and WE interventions resulted in differential improvements in physical functioning among generally healthy older adults. TC led to improvement in an indicator of cognitive functioning that was maintained through 12 mo.

Taylor-Piliae, R. E., E. Silva, et al. "Tai Chi as an adjunct physical activity for adults aged 45years and older enrolled in phase III cardiac rehabilitation." *Eur J Cardiovasc Nurs*.

BACKGROUND: Cardiac rehabilitation improves physical, cognitive and psychosocial functioning, yet services are greatly underutilized with increasing patterns of attrition over time. Tai Chi has been suggested as a possible adjunct to cardiac rehabilitation exercise training. AIM: To describe differences in physical, cognitive and psychosocial functioning among adults >=45years old attending phase III cardiac rehabilitation, who have or have not self-selected Tai Chi exercise as an adjunct physical activity. METHODS: A cross-sectional design compared subjects attending group-based Wu style Tai Chi classes plus cardiac rehabilitation, with cardiac rehabilitation only. Subjects had a battery of physical and cognitive functioning tests administered to examine

aerobic endurance, balance, strength, and flexibility, verbal retrieval/recall, attention, concentration and tracking. Subjects completed a health survey to ascertain cardiac event information, medical history, and psychosocial functioning (i.e. health-related quality of life, stress, depressive symptoms, social support, and Tai Chi self-efficacy). RESULTS: A total of 51 subjects (75% married, 84% college-educated, 96% White/European-American) participated. Subjects were on average 70 (+/-8)years old and had attended cardiac rehabilitation for 45 (+/-37) months. Approximately 45% (n=23) attended Tai Chi classes plus cardiac rehabilitation, while 55% (n=28) attended cardiac rehabilitation only. Subjects attending Tai Chi plus cardiac rehabilitation had better balance, perceived physical health, and Tai Chi self-efficacy compared to those attending cardiac rehabilitation only ( $p \leq 0.03$ ). CONCLUSION: Tai Chi can be easily implemented in any community/cardiac rehabilitation facility, and may offer adults additional options after a cardiac event.

Tsang, T. W., M. R. Kohn, et al. "Kung fu training improves physical fitness measures in overweight/obese adolescents: the "martial fitness" study." J Obes 2010.

Aim. To examine the efficacy of a six-month Kung Fu (KF) program on physical fitness in overweight/obese adolescents. Methods. Subjects were randomly assigned to the KF or sham exercise (Tai Chi, TC) control group. Physical measurements in cardiovascular fitness and muscle fitness occurred at baseline and after 6 months of training thrice weekly. Results. Twenty subjects were recruited. One subject was lost to follow-up, although overall compliance to the training sessions was 46.7 +/- 27.8%. At follow-up, the cohort improved in absolute upper ( $P = .002$ ) and lower ( $P = .04$ ) body strength, and upper body muscle endurance ( $P = .02$ ), without group differences. KF training resulted in significantly greater improvements in submaximal cardiovascular fitness ( $P = .03$ ), lower body muscle endurance ( $P = .28$ ; significant 95% CI: 0.37-2.49), and upper body muscle velocity ( $P = .03$ ) relative to TC training. Conclusions. This short-term KF program improved submaximal cardiovascular fitness, lower body muscle endurance, and muscle velocity, in overweight/obese adolescents with very low baseline fitness.

van Eijk-Hustings, Y., A. Boonen, et al. "A randomized trial of tai chi for fibromyalgia." N Engl J Med 363(23): 2266; author reply 2266-7.

Wang, C. "Serious concerns related to the article entitled "Tai Chi improves physical function in older Chinese women with knee osteoarthritis"." J Clin Rheumatol 16(7): 356.

Wang, C. "Tai chi and rheumatic diseases." Rheum Dis Clin North Am 37(1): 19-32.

Tai chi is a complex multicomponent mind-body exercise. Many studies have provided evidence that tai chi benefits patients with a variety of chronic disorders. This form of mind-body exercise enhances cardiovascular fitness, muscular strength, balance, and physical function and seems to be associated with reduced stress, anxiety, and depression and improved quality of life. Thus, despite certain limitations in the evidence, tai chi can be recommended to patients with osteoarthritis, rheumatoid arthritis, and fibromyalgia as a complementary and alternative

medical approach. This article overviews the current knowledge about tai chi to better inform clinical decision making for rheumatic patients.

Wang, C., R. Bannuru, et al. "Tai Chi on psychological well-being: systematic review and meta-analysis." *BMC Complement Altern Med* 10: 23.

**BACKGROUND:** Physical activity and exercise appear to improve psychological health. However, the quantitative effects of Tai Chi on psychological well-being have rarely been examined. We systematically reviewed the effects of Tai Chi on stress, anxiety, depression and mood disturbance in eastern and western populations. **METHODS:** Eight English and 3 Chinese databases were searched through March 2009. Randomized controlled trials, non-randomized controlled studies and observational studies reporting at least 1 psychological health outcome were examined. Data were extracted and verified by 2 reviewers. The randomized trials in each subcategory of health outcomes were meta-analyzed using a random-effects model. The quality of each study was assessed. **RESULTS:** Forty studies totaling 3817 subjects were identified. Approximately 29 psychological measurements were assessed. Twenty-one of 33 randomized and nonrandomized trials reported that 1 hour to 1 year of regular Tai Chi significantly increased psychological well-being including reduction of stress (effect size [ES], 0.66; 95% confidence interval [CI], 0.23 to 1.09), anxiety (ES, 0.66; 95% CI, 0.29 to 1.03), and depression (ES, 0.56; 95% CI, 0.31 to 0.80), and enhanced mood (ES, 0.45; 95% CI, 0.20 to 0.69) in community-dwelling healthy participants and in patients with chronic conditions. Seven observational studies with relatively large sample sizes reinforced the beneficial association between Tai Chi practice and psychological health. **CONCLUSIONS:** Tai Chi appears to be associated with improvements in psychological well-being including reduced stress, anxiety, depression and mood disturbance, and increased self-esteem. Definitive conclusions were limited due to variation in designs, comparisons, heterogeneous outcomes and inadequate controls. High-quality, well-controlled, longer randomized trials are needed to better inform clinical decisions.

Wang, C., C. H. Schmid, et al. "A randomized trial of tai chi for fibromyalgia." *N Engl J Med* 363(8): 743-54.

**BACKGROUND:** Previous research has suggested that tai chi offers a therapeutic benefit in patients with fibromyalgia. **METHODS:** We conducted a single-blind, randomized trial of classic Yang-style tai chi as compared with a control intervention consisting of wellness education and stretching for the treatment of fibromyalgia (defined by American College of Rheumatology 1990 criteria). Sessions lasted 60 minutes each and took place twice a week for 12 weeks for each of the study groups. The primary end point was a change in the Fibromyalgia Impact Questionnaire (FIQ) score (ranging from 0 to 100, with higher scores indicating more severe symptoms) at the end of 12 weeks. Secondary end points included summary scores on the physical and mental components of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36). All assessments were repeated at 24 weeks to test the durability of the response. **RESULTS:** Of the 66 randomly assigned patients, the 33 in the tai chi group had clinically important improvements in the FIQ total score and quality of life. Mean (+/-SD) baseline and 12-week FIQ scores for the tai chi group were 62.9+/-15.5 and 35.1+/-18.8, respectively, versus 68.0+/-11 and 58.6+/-17.6, respectively, for the control group (change from baseline in

the tai chi group vs. change from baseline in the control group, -18.4 points;  $P < 0.001$ ). The corresponding SF-36 physical-component scores were  $28.5 \pm 8.4$  and  $37.0 \pm 10.5$  for the tai chi group versus  $28.0 \pm 7.8$  and  $29.4 \pm 7.4$  for the control group (between-group difference, 7.1 points;  $P = 0.001$ ), and the mental-component scores were  $42.6 \pm 12.2$  and  $50.3 \pm 10.2$  for the tai chi group versus  $37.8 \pm 10.5$  and  $39.4 \pm 11.9$  for the control group (between-group difference, 6.1 points;  $P = 0.03$ ). Improvements were maintained at 24 weeks (between-group difference in the FIQ score, -18.3 points;  $P < 0.001$ ). No adverse events were observed. CONCLUSIONS: Tai chi may be a useful treatment for fibromyalgia and merits long-term study in larger study populations. (Funded by the National Center for Complementary and Alternative Medicine and others; ClinicalTrials.gov number, NCT00515008.)

Wang, W., M. Sawada, et al. "Tai Chi exercise versus rehabilitation for the elderly with cerebral vascular disorder: a single-blinded randomized controlled trial." *Psychogeriatrics* 10(3): 160-6.

BACKGROUND: Cerebral vascular disorder (CVD) might result in a quantifiable decrease in quality of life, which is determined not only by the neurological deficits but also by impairment of cognitive functions. There are few studies that report on the cognitive effect of Tai Chi exercise (Tai Chi) on the elderly with CVD. The purpose of the present study was to examine the cognitive effect of Tai Chi on the elderly with CVD using P300 measurement, in addition to the General Health Questionnaire (GHQ) and Pittsburgh Sleep Quality Index (PSQI). METHODS: A total of 34 patients with CVD were recruited from outpatient Akistu-Kounoike Hospital and randomly assigned to receive Tai Chi ( $n = 17$ ) or rehabilitation ( $n = 17$ ) in group sessions once a week for 12 weeks. To examine the time courses of each score (P300 amplitude, P300 latency, GHQ score and PSQI score), repeated-measures analysis of variance was carried out with groups and time as factors. RESULTS: For the time courses of P300 amplitudes and latencies, there were no significant effects of interaction between group and time. However, significant time-by-group interactions were found for Sleep Quality ( $P = 0.006$ ), GHQ total score ( $P = 0.005$ ), anxiety/insomnia score ( $P = 0.034$ ), and severe depression score ( $P = 0.020$ ). CONCLUSIONS: Tai Chi might therefore be considered a useful non-pharmacological approach, along with rehabilitation, for the maintenance of cognitive function in the elderly with CVD and might be a more useful non-pharmacological approach for the improvement of sleep quality and depressive symptoms in the elderly with CVD than rehabilitation.

Wong, A. M., S. W. Chou, et al. "Does different exercise have the same effect of health promotion for the elderly? Comparison of training-specific effect of Tai Chi and swimming on motor control." *Arch Gerontol Geriatr*.

It remains unclear whether Tai Chi Chuan (TCC) instead of swimming yields a training-specific effect on dynamic balance. The objective of the present study is to test if the practice of TCC provides a distinctive benefit of balance in the elderly. The participants in TCC ( $n = 32$ ) and swimming groups ( $n = 20$ ) practiced regular swimming and TCC respectively for at least 3 years before the recruitment. Thirty-four healthy and active elderly volunteers were also recruited as the control group. To evaluate balance, we used SMART Balance Master that yields

balance parameters including maximal stability, center-of-pressure velocity, and percentage ankle strategy obtained under six different balance conditions. We evaluated eye-hand coordination by measuring the movement time required to accurately point from one target to the next. In the most challenging balance conditions, the TCC group performed significantly better than the swimming and control groups. In eye-hand coordination tasks, both the TCC and swimming groups yielded significantly shorter movement time compared with the control group; however, no significant difference was observed between them. We concluded that both TCC and swimming improve eye-hand coordination in the elderly. However, TCC yields a better training effect on dynamic balance.

Wu, G., L. Keyes, et al. "Comparison of telecommunication, community, and home-based Tai Chi exercise programs on compliance and effectiveness in elders at risk for falls." *Arch Phys Med Rehabil* 91(6): 849-56.

OBJECTIVE: To compare the adherence to and effectiveness of Tai Chi exercise program through a live, interactive, telecommunication-based exercise (Tele-ex) with that of a similar program through a community center-based exercise (Comm-ex) and a home video-based exercise (Home-ex) among community-dwelling elders who are at risk for falls. DESIGN: Three groups randomized controlled trial with pretests and posttests. SETTING: Exercise programs were community-based, and the outcome measures were laboratory-based. PARTICIPANTS: Adults (N=64) age 65+ years with positive fall history in the previous year and/or significant fear of falling. INTERVENTION: A 24-form, Yang-style Tai Chi for 15 weeks, 3 hours a week. MAIN OUTCOME MEASURES: Exercise compliance, number of falls, fear of falling (Activities-specific Balance Confidence [ABC] score), self-perceived health (Medical Outcomes Study 36-Item Short Form Health Survey [SF-36]), Timed Up & Go (TUG), single leg stance (SLS), and body sway during quiet stance (medial-lateral foot center of pressure [ML-COP]). RESULTS: Tele-ex and Comm-ex groups demonstrated significantly higher exercise attendance and in-class practice time than the Home-ex group ( $P<.01$ ) and significant reductions in the mean number of falls and injurious falls ( $P<.01$ ). There were significant improvements posttraining in SLS, ABC, ML-COP, and Physical Health subscore of the SF-36 ( $P<.05$ ). Both Tele-ex and Comm-ex groups demonstrated larger improvements than the Home-ex group in TUG, ML-COP, and the Social Function, Mental Health, and Physical Health subscores of the MOS SF-36. CONCLUSION: Compared with the Home-ex, the Tele-ex and Comm-ex groups are better in exercise compliance, fall reduction and balance and health improvements. Tele-ex is an effective, affordable, and acceptable choice of exercise for elders.

Yeh, G. Y., T. J. Kaptchuk, et al. "Prescribing tai chi for fibromyalgia—are we there yet?" *N Engl J Med* 363(8): 783-4.

Yeh, G. Y., D. H. Roberts, et al. "Tai chi exercise for patients with chronic obstructive pulmonary disease: a pilot study." *Respir Care* 55(11): 1475-82.

OBJECTIVE: To determine the feasibility of a randomized controlled trial of the effect of a tai chi program on quality of life and exercise capacity in patients with COPD. METHODS: We randomized 10 patients with moderate to severe COPD to 12 weeks of tai chi plus usual care ( $n = 5$ ) or usual care alone ( $n = 5$ ). The tai chi training consisted of a 1-hour

class, twice weekly, that emphasized gentle movement, relaxation, meditation, and breathing techniques. Exploratory outcomes included disease-specific symptoms and quality-of-life, exercise capacity, pulmonary function tests, mood, and self-efficacy. We also conducted qualitative interviews to capture patient narratives regarding their experience with tai chi. RESULTS: The patients were willing to be randomized. Among 4 of the 5 patients in the intervention group, adherence to the study protocol was excellent. The cohort's baseline mean  $\pm$  SD age, percent-of-predicted FEV<sub>1</sub>, and ratio of FEV<sub>1</sub> to forced vital capacity were 66  $\pm$  6 y, 50  $\pm$  12%, and 0.63  $\pm$  0.14, respectively. At 12 weeks there was significant improvement in Chronic Respiratory Questionnaire score among the tai chi participants (1.4  $\pm$  1.1), compared to the usual-care group (-0.1  $\pm$  0.4) (P = .03). There were nonsignificant trends toward improvement in 6-min walk distance (55  $\pm$  47 vs -13  $\pm$  64 m, P = .09), Center for Epidemiologic Studies Depression Scale (-9.0  $\pm$  9.1 vs -2.8  $\pm$  4.3, P = .20), and University of California, San Diego Shortness of Breath score (-7.8  $\pm$  3.5 vs -1.2  $\pm$  11, P = .40). There were no significant changes in either group's peak oxygen uptake. CONCLUSIONS: A randomized controlled trial of tai chi is feasible in patients with moderate to severe COPD. Tai chi exercise as an adjunct to standard care warrants further investigation.

Zhang, F. and Y. Wu "A randomized trial of tai chi for fibromyalgia." N Engl J Med 363(23): 2265-6; author reply 2266-7.

Zhou, M., D. Zhou, et al. "A randomized trial of tai chi for fibromyalgia." N Engl J Med 363(23): 2265; author reply 2266-7.