

Annotated bibliography on tai chi studies during July 1, 2007 to August, 2008 for TCHC Members.

Assembled and annotated by Stephanie Taylor, MD PhD

(2007). "[Strength training and tai-chi to prevent accidental falls]." MMW Fortschr Med **149**(45): 14, 16.

(2007). "Tai chi gives immune system a boost." Harv Health Lett **32**(8): 7.

Abbott, R. B., K. K. Hui, et al. (2007). "A Randomized Controlled Trial of Tai Chi for Tension Headaches." Evid Based Complement Alternat Med **4**(1): 107-113.

This study examined whether a traditional low-impact mind-body exercise, Tai Chi, affects health-related quality-of-life (HRQOL) and headache impact in an adult population suffering from tension-type headaches. Forty-seven participants were randomly assigned to either a 15 week intervention program of Tai Chi instruction or a wait-list control group. HRQOL (SF-36v2) and headache status (HIT-6trade mark) were obtained at baseline and at 5, 10 and 15 weeks post-baseline during the intervention period. Statistically significant ($P < 0.05$) improvements in favor of the intervention were present for the HIT score and the SF-36 pain, energy/fatigue, social functioning, emotional well-being and mental health summary scores. A 15 week intervention of Tai Chi practice was effective in reducing headache impact and also effective in improving perceptions of some aspects of physical and mental health.

Aickin, M. (2007). "Does T'ai Chi Chuan improve health-related quality of life in elderly patients?" J Altern Complement Med **13**(10): 1053.

Barrow, D. E., A. Bedford, et al. (2007). "An evaluation of the effects of Tai Chi Chuan and Chi Kung training in patients with symptomatic heart failure: a randomised controlled pilot study." Postgrad Med J **83**(985): 717-21.

OBJECTIVE: To study the effect of Tai Chi on exercise tolerance in patients with moderate heart failure. DESIGN: Randomised parallel group study balanced for baseline variables. SETTING: Cardiology Department, Royal Hallamshire Hospital. PATIENTS AND METHODS: 52 patients (42 men, mean age (68.9 years), range (46-90 years), and 10 women, mean age (70.0 years), range (58-82)) with chronic heart failure (New York Heart Association symptom class II-III) were studied. Patients were randomised to Tai Chi Chuan twice a week for 16 weeks or to standard medical care without exercise rehabilitation. MAIN OUTCOME MEASURES: The primary outcome measure was the change in the distance walked in the shuttle walk test. Secondary outcome measures were changes in symptom scores and quality of life indices. RESULTS: Objective measures of exercise tolerance did not improve significantly with Tai Chi, but patients having Tai Chi exercise had an improvement in symptom scores of heart failure measured by the Minnesota Living

with Heart Failure Questionnaire (comparison of deltas, -2.4 control vs -14.9; $p = 0.01$), and depression scores measured by the SCL-90-R questionnaire (-2.9 vs -6.8; $p = 0.12$) compared with those patients in the control group. CONCLUSION: In patients with chronic heart failure, 16 weeks of Tai Chi training was safe, with no adverse exercise related problems. It was enjoyed by all taking part and led to significant improvements in symptoms and quality of life.

Bertisch, S. M., C. C. Wee, et al. (2008). "Use of Complementary and Alternative Therapies by Overweight and Obese Adults." *Obesity (Silver Spring)* **16**(7): 1610-1615.

Objective: Obesity is associated with higher health-care costs due, in part, to higher use of traditional health care. Few data are available on the relationship between obesity and the use of complementary and alternative medicine (CAM). **Methods and Procedures:** We analyzed data on CAM use from the 2002 National Health Interview Survey (NHIS) Alternative Medicine Supplement ($n = 31,044$). We compared the use of CAM overall, within the past 12 months, between normal weight (BMI from 18 to <25), overweight (from 25 to <30), mildly obese (from 30 to <35), moderately obese (from 35 to <40), and extremely obese (>40) adults. For the primary analysis, our multivariable model was adjusted for sociodemographic factors, insurance status, medical conditions, and health behaviors. We performed additional analyses to explore the association of BMI and the use of seven CAM modalities. **Results:** We found that adults with obesity have lower prevalence of use of yoga therapy, and similar prevalence of use of several CAM modalities, including relaxation techniques, natural herbs, massage, chiropractic medicine, tai chi, and acupuncture, compared to normal-weight individuals. After adjustment for sociodemographic factors, insurance status, medical conditions, and health behaviors, adults with obesity were generally less likely to use most individual CAM modalities, although the magnitude of these differences were quite modest in many cases. **Discussion:** Even though adults with obesity have a greater illness burden and higher utilization of traditional medical care, adults with higher BMIs were no more likely to use each of the individual CAM therapies studied. Additional research is needed to improve our understanding of CAM use by adults with obesity. *Obesity* (2008) 16 7, 1610-1615. doi:10.1038/oby.2008.239.

Brismee, J. M., R. L. Paige, et al. (2007). "Group and home-based tai chi in elderly subjects with knee osteoarthritis: a randomized controlled trial." *Clin Rehabil* **21**(2): 99-111.

OBJECTIVE: To evaluate the effects of tai chi consisting of group and home-based sessions in elderly subjects with knee osteoarthritis. **DESIGN:** A randomized, controlled, single-blinded 12-week trial with stratification by age and sex, and six weeks of follow-up. **SETTING:** General community. **PARTICIPANTS:** Forty-one adults (70 +/- 9.2 years) with knee osteoarthritis. **INTERVENTIONS:** The tai chi programme featured six weeks of group tai chi sessions, 40 min/session, three times a week, followed by another six weeks (weeks 7 -12) of home-based tai chi training. Subjects were requested to discontinue tai chi training during a six-week follow-up detraining period (weeks 13-18). Subjects in the attention control group

attended six weeks of health lectures following the same schedule as the group-based tai chi intervention (weeks 0 -6), followed by 12 weeks of no activity (weeks 7-18). MAIN OUTCOME MEASURES: Knee pain measured by visual analogue scale, knee range of motion and physical function measured by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) were recorded at baseline and every three weeks throughout the 18-week study period. Data were analysed using a mixed model ANOVA. RESULTS: The six weeks of group tai chi followed by another six weeks of home tai chi training showed significant improvements in mean overall knee pain ($P = 0.0078$), maximum knee pain ($P = 0.0035$) and the WOMAC subscales of physical function ($P = 0.0075$) and stiffness ($P = 0.0206$) compared to the baseline. No significant change of any outcome measure was noted in the attention control group throughout the study. The tai chi group reported lower overall pain and better WOMAC physical function than the attention control group at weeks 9 and 12. All improvements disappeared after detraining.

Burke, D. T., S. Al-Adawi, et al. (2007). "Martial arts as sport and therapy." J Sports Med Phys Fitness **47**(1): 96-102.

The term Martial Arts is often used as general phrase to describe many of the combat arts, which have developed in eastern cultures over the past millennium. This paper reviews the Martial Arts from the original context of a trio of life skills. This trio includes the healing arts such as acupuncture, the self-exploration arts such as yoga, and the vital life skills such as meditation. As Martial Arts suggests the waging of combat, the origins of the most common combat arts are reviewed, with an overview of the difference between the hard and the soft styles. The arts developed not only in the eastern, but also in all parts of the world, with references of these types of combats arts in the writings of the ancient Egyptians and Greeks. In modern times, the combat arts are performed for both exercise and sport. A review of the injuries that occur, and the health benefits that might be expected are discussed. A review of the medical literature that demonstrates some of these health benefits is included, with Tai Chi Chuan as the most studied of these. The health benefits discussed include strengthen and self-efficacy of the elderly, reduced falls, increased exercise capacity, and benefits to the immune system and autonomic nervous system. The paper emphasized the breadth of the Martial Arts and the import of these to the sports and health community.

Carpenter, J., B. Gajewski, et al. (2008). "Bayesian data analysis: estimating the efficacy of T'ai Chi as a case study." Nurs Res **57**(3): 214-9.

BACKGROUND: Bayesian inference provides a formal framework for updating knowledge by combining prior knowledge with current data. Over the past 10 years, the Bayesian paradigm has become a popular analytic tool in health research. Although the nursing literature contains examples of Bayes' theorem applications to clinical decision making, it lacks an adequate introduction to Bayesian data analysis. METHODS: Bayesian data analysis is introduced through a fully Bayesian model for determining the efficacy of tai chi as an illustrative example. The mechanics of using Bayesian models to combine prior knowledge, or data from previous studies, with observed data from a current study are discussed. RESULTS:

The primary outcome in the illustrative example was physical function. Three prior probability distributions (priors) were generated for physical function using data from a similar study found in the literature. Each prior was combined with the likelihood from observed data in the current study to obtain a posterior probability distribution. In each case, the posterior distribution showed that the probability that the control group is better than the tai chi treatment group was low. **DISCUSSION:** Bayesian analysis is a valid technique that allows the researcher to manage varying amounts of data appropriately. As advancements in computer software continue, Bayesian techniques will become more accessible. Researchers must educate themselves on applications for Bayesian inference, as well as its methods and implications for future research.

Chang, T. S., H. Y. Ding, et al. (2007). "Metabolism of the soy isoflavones daidzein and genistein by fungi used in the preparation of various fermented soybean foods." Biosci Biotechnol Biochem **71**(5): 1330-3.

The ability of fungi used in the preparation of fermented soybean foods to metabolize the soy isoflavones daidzein and genistein was investigated. A total of 21 fungal strains from dou-chi, miso, sake, soy sauce, and sufu were screened. The genera of the tested fungi included Actinomucor, Aspergillus, Candida, Debaryomyces, Monascus, Mucor, Rhizopus, Saccharomyces, and Zygosaccharomyces. The results were that all tested Aspergillus strains from these soybean foods, including five *A. oryzae* strains, one *A. sojae* strain, and one *A. tamarii* strain, metabolized both daidzein and genistein. In contrast, no other tested fungi from the fermented soybean foods metabolized either daidzein or genistein. The metabolites of daidzein and genistein by Aspergillus strains were identified as 8-hydroxydaidzein and 8-hydroxygenistein, respectively, based on their mass, (1)H-, and (13)C-NMR spectra.

Chang, Y. F., Y. H. Yang, et al. (2008). "Tai Chi Chuan training improves the pulmonary function of asthmatic children." J Microbiol Immunol Infect **41**(1): 88-95.

BACKGROUND AND PURPOSE: Tai Chi Chuan, a traditional Chinese exercise, is thought to improve cardiopulmonary function in patients with chronic disease. This study investigated the effect of Tai Chi Chuan on the pulmonary function and daily symptoms of asthmatic children. **METHODS:** Thirty asthmatic children were enrolled into the study. Fifteen of the 30 children participated in a 12-week Tai Chi Chuan program and the remaining 15 constituted the control group. Prior to study participation, the pulmonary function of all enrolled children was assessed at rest, after exercise, and after exercise plus iced water. A 3-day symptoms questionnaire was also completed and a score obtained after each pulmonary function test. **RESULTS:** There were no significant differences between the two groups in baseline pulmonary function and severity of asthmatic symptoms before study commencement, at rest, after exercise, or after exercise plus iced water. However, after the 12-week program, children in the Tai Chi Chuan group had a significant improvement in pulmonary function compared to the control group. Although there were no significant differences in post-training symptom scores at rest and after

exercise between the two groups, under the stronger challenge of exercise plus iced water, children in the Tai Chi Chuan group had milder symptoms than those in the control group. CONCLUSION: Our data show that Tai Chi Chuan can improve the pulmonary function of asthmatic children. However, long-term follow-up is required to determine the impact of Tai Chi Chuan on the severity of asthmatic symptoms.

Chen, K. M., Y. C. Hsu, et al. (2007). "Well-being of institutionalized elders after Yang-style Tai Chi practice." J Clin Nurs **16**(5): 845-52.

Chen, K. M., C. H. Li, et al. (2007). "A feasible method to enhance and maintain the health of elderly living in long-term care facilities through long-term, simplified tai chi exercises." J Nurs Res **15**(2): 156-64.

Practicing Tai Chi offers the potential to enhance the physical and mental health of older adults. Identifying a feasible way to encourage regular Tai Chi practice is essential if Tai Chi is to be promoted as a long-term, daily activity for elderly care facility residents. The purpose of this study was to test the effectiveness and feasibility of using an audiovisual, simplified Tai Chi exercise module to enhance and maintain the health of long-term care facility residents. A quasi-experimental, one-group, time-series design was used. Data were collected six times (twice before the intervention; four times after intervention started) at three-month intervals. Fifty-one elderly male subjects were recruited by convenience sampling. A 50-minute Simplified Tai-Chi Exercise Program (STEP) was implemented in two small groups three times a week for 12 months. During the first six-month period, participants received guidance from an actual instructor. During the second six-month period, guidance was delivered via a video tape and displayed on a television screen. Results indicated that participants' physical health (cardio-respiratory function, lower body flexibility, and hand-gripping strength) and mental health (quality of sleep) had both improved significantly six months after intervention started, with improvements maintained throughout the end of the 12-month study (all p values < .05). Instructor-led STEP training followed by practice using appropriate audiovisual aids represents a feasible and effective method to implement a long-term activity program in long-term elderly care facilities.

Chen, K. M., J. N. Lin, et al. (2008). "The effects of a Simplified Tai-Chi Exercise Program (STEP) on the physical health of older adults living in long-term care facilities: a single group design with multiple time points." Int J Nurs Stud **45**(4): 501-7.

BACKGROUND: Studies support the positive effects that Tai Chi has on the physical health of older adults. However, many older adults residing in long-term care facilities feel too weak to practice traditional Tai Chi, and a more simplified style is preferred. OBJECTIVE: To test the effects of a newly-developed, Simplified Tai-Chi Exercise Program (STEP) on the physical health of older adults who resided in long-term care facilities. DESIGN: A single group design with multiple time points: three pre-tests, one month apart; four post-tests at one month, two months, three months, and six months after intervention started. SETTINGS: Two 300-400 bed veteran homes in Taiwan. PARTICIPANTS: The 51 male older adults were recruited

through convenience sampling, and 41 of them completed six-month study. Inclusion criteria included: (1) aged 65 and over; (2) no previous training in Tai Chi; (3) cognitively alert and had a score of at least eight on the Short Portable Mental Status Questionnaire; (4) able to walk without assistance; and (5) had a Barthel Index score of 61 or higher. Participants who had dementia, were wheelchair bound, or had severe or acute cardiovascular, musculoskeletal, or pulmonary illnesses were excluded. METHODS: The STEP was implemented three times a week, 50 min per session for six months. The outcome measures included cardio-respiratory function, blood pressure, balance, hand-grip strength, lower body flexibility, and physical health actualization. RESULTS: A drop in systolic blood pressure ($p=.017$) and diastolic blood pressure ($p<.001$) was detected six months after intervention started. Increase in hand-grip strength from pre to post intervention was found (left hand: $p<.001$; right hand: $p=.035$). Participants also had better lower body flexibility after practicing STEP ($p=.038$). CONCLUSIONS: Findings suggest that the STEP be incorporated as a floor activity in long-term care facilities to promote physical health of older adults.

Cheng, T. O. (2007). "Effect of Tai Chi on endothelial function." Clin Cardiol **30**(3): 150.

Cherniack, E. P., H. J. Florez, et al. (2007). "Emerging therapies to treat frailty syndrome in the elderly." Altern Med Rev **12**(3): 246-58.

Frailty syndrome (FS) has become increasingly recognized as a major predictor of co-morbidities and mortality in older individuals. Interventions with the potential to benefit frail elders include nutritional supplementation (vitamins D, carotenoids, creatine, dehydroepiandrosterone (DHEA), and beta-hydroxy-beta-methylbutyrate) and exercise modalities (tai chi and cobblestone walking). While these have not been explicitly tested for their impact on FS, vitamin D supplementation appears to offer significant promise in enhancing long-term health of the elderly. Exercise modalities such as tai chi and cobblestone walking, because of probable low risk and ease of participation, may also confer benefit. Additional studies are needed to investigate interventions that directly prevent, delay, and/or ameliorate frailty. Successful therapies may well involve multi-component approaches utilizing a combination of medication, nutritional supplementation, and exercise.

Cheung, S. Y., E. Tsai, et al. (2007). "Physical benefits of Tai Chi Chuan for individuals with lower-limb disabilities." Occup Ther Int **14**(1): 1-10.

This paper reports on an experimental study that examined the effect of a 15-week Tai Chi Chuan (TCC) exercise programme on the cardiovascular function, pulmonary function, and shoulder range of motion of persons with lower-limb disability. The experimental group comprised 22 people with lower limb disabilities and a control group of 17 participants. The experimental group was provided with 30 sessions of TCC training while the control group did not receive any intervention. After 30 sessions of TCC, significant improvements in shoulder external rotation and shoulder extension were found among participants of the experimental group. Improvements in cardiovascular and pulmonary functions were not significant. The

investigators concluded that a 15-week TCC programme with mild exercise could be an effective tool for improving shoulder flexibility and muscle strength among sedentary individuals with lower-limb disabilities. Further research is recommended in examining the long-term effects of TCC on improving cardiovascular and respiratory functions in individuals with lower-limb disabilities.

Cho, K. L. (2008). "Effect of Tai Chi on depressive symptoms amongst Chinese older patients with major depression: the role of social support." *Med Sport Sci* **52**: 146-54.

The objective of this study was to determine whether the effects of Tai Chi training on depressive symptoms in Chinese older patients with depression remained statistically significant after social support was controlled. Fourteen community-dwelling older patients from a psychogeriatric outpatient clinic were randomly assigned to either a 3-month Tai Chi intervention with 36 sessions or a wait-list control. Depression was assessed by the Center for Epidemiological Studies Depression Scale (CES-D), whereas social support was measured by the Lubben Social Network Scale (LSNS). By performing multiple regression analyses, we examined whether the effect of group assignment (Tai Chi and control groups) on five measures of depressive symptoms (i.e. the total scores of the CES-D scale, and scores of all its subscales including symptoms related to somatic, negative affect, interpersonal relation, and well-being) remained significant after controlling for age, gender, education, and LSNS. Results indicate that the beneficial impact of Tai Chi on five measures of depressive symptoms remained significant when we adjusted for age, gender, and education. On the other hand, the effect of our intervention disappeared when changes of social support were controlled for. Social support might be partly responsible for the effect of Tai Chi on depressive symptoms because practicing Tai Chi is a social activity in nature.

Esch, T., J. Duckstein, et al. (2007). "Mind/body techniques for physiological and psychological stress reduction: stress management via Tai Chi training - a pilot study." *Med Sci Monit* **13**(11): CR488-497.

BACKGROUND: Stress can affect health. There is a growing need for the evaluation and application of professional stress management options, i.e, stress reduction. Mind/body medicine serves this goal, e.g, by integrating self-care techniques into medicine and health care. Tai Chi (TC) can be classified as such a mind/body technique, potentially reducing stress and affecting physical as well as mental health parameters, which, however, has to be examined further.

MATERIAL/METHODS: We conducted a prospective, longitudinal pilot study over 18 weeks for the evaluation of subjective and objective clinical effects of a Yang style TC intervention in young adults (beginners) by measuring physiological (blood pressure, heart rate, saliva cortisol) and psychological (SF-36, perceived stress, significant events) parameters, i.e, direct or indirect indicators of stress and stress reduction, in a non-randomised/-controlled, yet non-selected cohort (n=21) by pre-to-post comparison and in follow-up. SF-36 values were also compared with the age-adjusted norm population, serving as an external control. Additionally, we measured diurnal cortisol profiles in a cross-sectional sub-study (n=2+2, pre-to-

post), providing an internal random control sub-sample. RESULTS: Only nine participants completed all measurements. Even so, we found significant ($p < 0.05$) reductions of saliva cortisol (post and follow-up), which seems to be an indicator of general stress reduction. A significant decrease in perceived mental stress (post) proved even highly significant ($p < 0.01$) in the follow-up, whereas physical stress perception declined to a much lesser degree. Significant improvements were also detected for the SF-36 dimensions general health perception, social functioning, vitality, and mental health/psychological well-being. Thus, the summarized mental health measures all clearly improved, pointing towards a predominantly psychological impact of TC. CONCLUSIONS: Subjective health increased, stress decreased (objectively and subjectively) during TC practice. Future studies should confirm this observation by rigorous methodology and by further combining physical and psychological measurements with basic research, thereby also gaining knowledge of autoregulation and molecular physiology that possibly underlies mind/body medicine.

Forbes, D., S. Forbes, et al. (2008). "Physical activity programs for persons with dementia." Cochrane Database Syst Rev(3): CD006489.

BACKGROUND: There is some evidence that physical activity delays the onset of dementia in healthy older adults and slows down cognitive decline to prevent the onset of cognitive disability. Studies using animal models suggest that physical activity has the potential to attenuate the pathophysiology of dementia. 'Physical activity' refers to 'usual care plus physical activity'. OBJECTIVES: Primary: do physical activity programs maintain or improve cognition, function, behaviour, depression, and mortality compared to usual care in older persons with dementia? Secondary: do physical activity programs have an indirect positive impact on family caregivers' health, quality of life, and mortality compared to family caregivers of older persons with dementia who received usual care alone? Do physical activity programs reduce the use of health care services (e.g., visits to the emergency department) compared to usual care in older persons with dementia and their family caregiver? SEARCH STRATEGY: The trials were identified from searches of the Specialized Register of the Cochrane Dementia and Cognitive Improvement Group, The Cochrane Library, MEDLINE, EMBASE, PsycINFO, CINAHL and LILACS on 9 September 2007 using the search terms: exercise OR "physical activity" OR cycling OR swim* OR gym* OR walk* OR danc* OR yoga OR "tai chi". SELECTION CRITERIA: All relevant, randomized controlled trials in which physical activity programs were compared with usual care for the effect on managing or improving cognition, function, behaviour, depression, and mortality in people with dementia of any type and degree of severity. Secondary outcomes related to the family caregiver(s) included quality of life, mortality, and use of health care services were intended to be examined. DATA COLLECTION AND ANALYSIS: Two reviewers independently assessed the retrieved articles for relevance and methodological quality, and extracted data from the selected trials. These were pooled where appropriate. MAIN RESULTS: Four trials met the inclusion criteria. However, only two trials were included in the analyses because the required data from the other two trials were not made available. Only one meta-analysis was conducted. The results from this review suggest that there is insufficient evidence of the

effectiveness of physical activity programs in managing or improving cognition, function, behaviour, depression, and mortality in people with dementia. Few trials have examined these important outcomes. In addition, family caregiver outcomes and use of health care services were not reported in any of the included trials. **AUTHORS' CONCLUSIONS:** There is insufficient evidence to be able to say whether or not physical activity programs are beneficial for people with dementia.

Fransen, M., L. Nairn, et al. (2007). "Physical activity for osteoarthritis management: a randomized controlled clinical trial evaluating hydrotherapy or Tai Chi classes." Arthritis Rheum **57**(3): 407-14.

OBJECTIVE: To determine whether Tai Chi or hydrotherapy classes for individuals with chronic symptomatic hip or knee osteoarthritis (OA) result in measurable clinical benefits. **METHODS:** A randomized controlled trial was conducted among 152 older persons with chronic symptomatic hip or knee OA. Participants were randomly allocated for 12 weeks to hydrotherapy classes (n = 55), Tai Chi classes (n = 56), or a waiting list control group (n = 41). Outcomes were assessed 12 and 24 weeks after randomization and included pain and physical function (Western Ontario and McMaster Universities Osteoarthritis Index), general health status (Medical Outcomes Study Short Form 12 Health Survey [SF-12], version 2), psychological well-being, and physical performance (Up and Go test, 50-foot walk time, timed stair climb). **RESULTS:** At 12 weeks, compared with controls, participants allocated to hydrotherapy classes demonstrated mean improvements (95% confidence interval) of 6.5 (0.4, 12.7) and 10.5 (3.6, 14.5) for pain and physical function scores (range 0-100), respectively, whereas participants allocated to Tai Chi classes demonstrated improvements of 5.2 (-0.8, 11.1) and 9.7 (2.8, 16.7), respectively. Both class allocations achieved significant improvements in the SF-12 physical component summary score, but only allocation to hydrotherapy achieved significant improvements in the physical performance measures. All significant improvements were sustained at 24 weeks. In this almost exclusively white sample, class attendance was higher for hydrotherapy, with 81% attending at least half of the available 24 classes, compared with 61% for Tai Chi. **CONCLUSION:** Access to either hydrotherapy or Tai Chi classes can provide large and sustained improvements in physical function for many older, sedentary individuals with chronic hip or knee OA.

Gatts, S. (2008). "Neural mechanisms underlying balance control in Tai Chi." Med Sport Sci **52**: 87-103.

BACKGROUND AND AIMS: The efficacy of Tai Chi (TC) to improve neuromuscular response characteristics underlying dynamic balance recovery in balance-impaired seniors at high risk for falling was examined during perturbed walking. **METHODS:** Twenty-two subjects were randomized into TC or control groups. Nineteen subjects (68-92 years, BERG 44 or less) completed the study. TC training incorporated repetitive exercises using TC's essential motor/biomechanical strategies, techniques, and postural components. Control training used axial exercises, balance awareness/education and stress reduction. Groups trained 1.5 h/day, 5 days/week for 3 weeks. After post-testing, controls received TC training. Subjects walked

across a force plate triggered to move forward 15 cm at 40 cm/s at heelstrike. Tibialis anterior and medial gastrocnemius responses during balance recovery were recorded from electromyograms. Four clinical measures of balance were also examined. RESULTS: TC subjects, but not controls, significantly reduced tibialis anterior response time from 148.92 +/- 45.11 ms to 98.67 +/- 17.22 ms ($p < \text{or} = 0.004$) and decreased co-contraction of antagonist muscles ($p < \text{or} = 0.003$) of the perturbed leg. All clinical balance measures significantly improved after TC. CONCLUSIONS: TC training transferred to improved neuromuscular responses controlling the ankle joint during perturbed gait in balance-impaired seniors who had surgical interventions to their back, hips, knees and arthritis. The fast, accurate neuromuscular activation crucial for efficacious response to slips also transferred to four clinical measures of functional balance. Significant enhancement was achieved with 3 weeks of training.

Gooneratne, N. S. (2008). "Complementary and alternative medicine for sleep disturbances in older adults." Clin Geriatr Med **24**(1): 121-38, viii.

Complementary and alternative medicines (CAM) are frequently used for the treatment of sleep disorders, but in many cases patients do not discuss these therapies directly with their health care provider. There is a growing body of well-designed clinical trials using CAM that have shown the following: (1) Melatonin is an effective agent for the treatment of circadian phase disorders that affect sleep; however, the role of melatonin in the treatment of primary or secondary insomnia is less well established. (2) Valerian has shown a benefit in some, but not all clinical trials. (3) Several other modalities, such as Tai Chi, acupuncture, acupressure, yoga, and meditation have improved sleep parameters in a limited number of early trials. Future work examining CAM has the potential to significantly add to our treatment options for sleep disorders in older adults.

Greenspan, A. I., S. L. Wolf, et al. (2007). "Tai chi and perceived health status in older adults who are transitionally frail: a randomized controlled trial." Phys Ther **87**(5): 525-35.

BACKGROUND AND PURPOSE: Tai chi, a Chinese exercise derived from martial arts, while gaining popularity as an intervention for reducing falls in older adults, also may improve health status. The purpose of this study was to determine whether intense tai chi (TC) exercise could improve perceived health status and self-rated health (SRH) more than wellness education (WE) for older adults who are transitionally frail. SUBJECTS: Study subjects were 269 women who were ≥ 70 years of age and who were recruited from 20 congregate independent senior living facilities. METHODS: Participants took part in a 48-week, single-blind, randomized controlled trial. They were randomly assigned to receive either TC or WE interventions. Participants were interviewed before randomization and at 1 year regarding their perceived health status and SRH. Perceived health status was measured with the Sickness Impact Profile (SIP). RESULTS: Compared with WE participants, TC participants reported significant improvements in the physical dimension and ambulation categories and borderline significant improvements in the body care and movement category of the SIP. Self-rated health did not change

for either group. DISCUSSION AND CONCLUSION: These findings suggest that older women who are transitionally frail and participate in intensive TC exercise demonstrate perceived health status benefits, most notably in ambulation.

Hackney, M. E. and G. M. Earhart (2008). "Tai Chi improves balance and mobility in people with Parkinson disease." Gait Posture.

This pilot study examines the effects of Tai Chi on balance, gait and mobility in people with Parkinson disease (PD). Thirty-three people with PD were randomly assigned to either a Tai Chi group or a control group. The Tai Chi group participated in 20 1-h long training sessions completed within 10-13 weeks; whereas, the control group had two testing sessions between 10 and 13 weeks apart without interposed training. The Tai Chi group improved more than the control group on the Berg Balance Scale, UPDRS, Timed Up and Go, tandem stance test, six-minute walk, and backward walking. Neither group improved in forward walking or the one leg stance test. All Tai Chi participants reported satisfaction with the program and improvements in well-being. Tai Chi appears to be an appropriate, safe and effective form of exercise for some individuals with mild-moderately severe PD.

Harmer, P. A. and F. Li (2008). "Tai Chi and falls prevention in older people." Med Sport Sci **52**: 124-34.

BACKGROUND: Considerable research evidence has been accumulated since 1990 that practicing Tai Chi can ameliorate multiple characteristics in older adults that place them at increased risk of falling, including poor balance, loss of strength, limited flexibility, and fear of falling. However, relatively few studies have directly examined the influence of Tai Chi practice on falls in this population. RESULTS: Nine randomized controlled trials utilizing Tai Chi (n = 6), or Tai Chi-inspired exercise (n = 3), were published between 1996 and July, 2007. The studies varied considerably on study settings, participant characteristics, sample size, type of Tai Chi intervention, length of intervention and quality of the study design. Of the six studies that used Tai Chi forms, three showed significant improvement in fall-related outcomes. One study using Tai Chi-inspired exercise also had a significant fall-related outcome. CONCLUSION: Despite the evidence demonstrating the beneficial influence of Tai Chi practice on known risk factors for falling in older adults, evidence indicating an actual impact on falls-related outcomes is equivocal. More large-scale, longitudinal studies with consistent intervention parameters and clinically meaningful outcome variables are needed to clarify the role of Tai Chi in effective falls prevention programs. The recent development of a standardized, research-to-practice Tai Chi falls prevention program may be an important step in this process.

Hill, K., R. Smith, et al. (2007). "Physical and psychological outcomes of a supported physical activity program for older carers." J Aging Phys Act **15**(3): 257-71.

This study evaluated health benefits of a supported physical activity program for 116 older carers (mean age 64.4 [SD = 7.9], 85% women). Participants undertook

a 6-month center-based physical activity program (strength training, yoga, or Tai Chi). Eighty-eight participants (76%) completed the program. Multivariate repeated-measures ANOVA identified overall significant improvement postintervention ($p = .004$). Univariate analyses revealed significant improvements for balance, strength, gait endurance, depression, and SF-36 (physical component; $p < .05$). There was no change in the Zarit Carer Burden Scale ($p > .05$). Change in performance scores did not differ significantly between those with higher and lower attendance at classes, although there was significantly greater improvement in gait endurance and balance ($p < .05$) in those attending classes run twice weekly than in those attending once-weekly classes. In conclusion, a carer physical activity program, providing additional carer support to facilitate participation, can achieve high levels of involvement by carers and significant health benefits.

Ho, T. J., W. M. Liang, et al. (2007). "Health-related quality of life in the elderly practicing T'ai Chi Chuan." J Altern Complement Med **13**(10): 1077-83.

OBJECTIVE: Previous studies have shown health benefits of T'ai Chi Chuan (TCC). In Taiwan, TCC is a form of exercise that is widely practiced by the elderly. The aim of this cross-sectional study was to investigate the effects of TCC on the health-related quality of life (HRQOL) in the senior population. **METHODS:** Subjects who regularly practiced TCC in Taiwan were selected by random sampling and included 140 seniors (77 males and 63 females, aged 40-70 years). The questionnaire was separated into 2 parts: demographic information and the SF-36 questionnaire, which used 8 domains to evaluate the subjects' HRQOL. The results were compared with those of 560 age- and sex-matched control subjects that were taken from the general population (308 males and 252 females). Multiple regression analysis was used to compare the quality of life in each of the 8 domains between the 2 groups. **RESULTS:** The TCC group showed significantly higher quality-of-life scores than the control group in each of the 8 domains with the exception of the bodily pain scales. Using multiple linear regression adjusted for covariates, the TCC group had significantly higher scores in physical functioning, physical roles, general health, vitality, and social-functioning scales than the control group. In most of the domains in both the TCC group and the control group, quality of life became worse with increased age, whereas the scores in vitality and social-functioning domains of the TCC group showed a reverse trend; they remained unchanged or even improved with increased age. **CONCLUSIONS:** Our study supports the hypothesis that TCC improves quality of life among the elderly in Taiwan, but further study must be conducted to more conclusively show the link between TCC and health-related QOL.

Hong, Y. (2008). "Preface. The first collection of scientific studies on Tai Chi Chuan." Med Sport Sci **52**: VIII-X.

Hong, Y. and J. X. Li (2007). "Biomechanics of Tai Chi: a review." Sports Biomech **6**(3): 453-64.

Tai Chi Chuan is a favourite form of exercise throughout the world and has drawn increasing research interest from international scientists. Biomechanical research

into Tai Chi has grown substantially and has provided evidence of the beneficial effects of Tai Chi exercise on health, fitness, and prevention of falls. This paper reviews studies that have explored the biomechanical aspects of Tai Chi, such as balance, kinematics, kinetics, strength, and neuromuscular activities.

Hong, Y., W. Mao de, et al. (2008). "Temporal characteristics of foot movement in Tai Chi exercise." Med Sport Sci **52**: 1-11.

The concept of proper foot movement is always emphasized in the practice of Tai Chi. Sixteen experienced Tai Chi practitioners participated in this study. Each subject practiced the whole set of 42-form Tai Chi movements and the performance was video-recorded and analyzed. The study found that Tai Chi is performed with the interchange of seven support patterns and six step directions of the foot. Compared with normal walking, there is a bigger percentage of time spent performing double support and less percentage of time spent performing single support movements in Tai Chi. However, the average duration of each support movement is longer and the change from one type of support to another is slower. In Tai Chi, the duration of steps in each direction is short and there are frequent changes from one direction to another. Tai Chi was found to be more effective than walking in simulating the gait challenges that are encountered in daily activities.

Hoo, J. J. and C. K. Stein (2007). ""Zwilling" versus "Tai Chi" configuration of double-sized ring chromosome." Am J Med Genet A **143A**(8): 903-5.

Hui, E. S., J. O. Cheng, et al. (2008). "Benefits of Tai Chi in palliative care for advanced cancer patients." Palliat Med **22**(1): 93-4.

Innes, K. E., T. K. Selfe, et al. (2008). "Menopause, the metabolic syndrome, and mind-body therapies." Menopause.

Cardiovascular disease risk rises sharply with menopause, likely due to the coincident increase in insulin resistance and related atherogenic changes that together comprise the metabolic or insulin resistance syndrome, a cluster of metabolic and hemodynamic abnormalities strongly implicated in the pathogenesis and progression of cardiovascular disease. A growing body of research suggests that traditional mind-body practices such as yoga, tai chi, and qigong may offer safe and cost-effective strategies for reducing insulin resistance syndrome-related risk factors for cardiovascular disease in older populations, including postmenopausal women. Current evidence suggests that these practices may reduce insulin resistance and related physiological risk factors for cardiovascular disease; improve mood, well-being, and sleep; decrease sympathetic activation; and enhance cardiovagal function. However, additional rigorous studies are needed to confirm existing findings and to examine long-term effects on cardiovascular health.

Irwin, M. R., R. Olmstead, et al. (2008). "Improving sleep quality in older adults with moderate sleep complaints: A randomized controlled trial of Tai Chi Chih." Sleep **31**(7): 1001-8.

STUDY OBJECTIVES: To determine the efficacy of a novel behavioral intervention, Tai Chi Chih, to promote sleep quality in older adults with moderate sleep complaints. **DESIGN:** Randomized controlled trial with 16 weeks of teaching followed by practice and assessment 9 weeks later. The main outcome measure was sleep quality, as assessed by the Pittsburgh Sleep Quality Index (PSQI). **SETTING:** General community at 2 sites in the US between 2001 and 2005. **PARTICIPANTS:** Volunteer sample of 112 healthy older adults, aged 59 to 86 years. **Intervention:** Random allocation to Tai Chi Chih or health education for 25 weeks. **RESULTS:** Among adults with moderate sleep complaints, as defined by PSQI global score of 5 or greater, subjects in the Tai Chi Chih condition were more likely to achieve a treatment response, as defined by PSQI less than 5, compared to those in health education ($P < 0.05$). Subjects in the Tai Chi Chih condition with poor sleep quality also showed significant improvements in PSQI global score ($P < 0.001$) as well as in the sleep parameters of rated sleep quality ($P < 0.05$), habitual sleep efficiency ($P < 0.05$), sleep duration ($P < 0.01$), and sleep disturbance ($P < 0.01$). **CONCLUSIONS:** Tai Chi Chih can be considered a useful nonpharmacologic approach to improve sleep quality in older adults with moderate complaints and, thereby, has the potential to ameliorate sleep complaints possibly before syndromal insomnia develops. **CLINICAL TRIALS REGISTRATION:** ClinicalTrials.gov Identifier: NCT00118885.

Irwin, M. R., R. Olmstead, et al. (2007). "Augmenting immune responses to varicella zoster virus in older adults: a randomized, controlled trial of Tai Chi." J Am Geriatr Soc **55**(4): 511-7.

OBJECTIVES: To evaluate the effects of a behavioral intervention, Tai Chi, on resting and vaccine-stimulated levels of cell-mediated immunity (CMI) to varicella zoster virus (VZV) and on health functioning in older adults. **DESIGN:** A prospective, randomized, controlled trial with allocation to two arms (Tai Chi and health education) for 25 weeks. After 16 weeks of intervention, subjects were vaccinated with VARIVAX, the live attenuated Oka/Merck VZV vaccine licensed to prevent varicella. **SETTING:** Two urban U.S. communities between 2001 and 2005. **PARTICIPANTS:** A total of 112 healthy older adults aged 59 to 86. **MEASUREMENTS:** The primary endpoint was a quantitative measure of VZV-CMI. Secondary outcomes were scores on the Medical Outcomes Study 36-item Short-Form Health Survey (SF-36). **RESULTS:** The Tai Chi group showed higher levels of VZV-CMI than the health education group ($P < .05$), with a significant rate of increase ($P < .001$) that was nearly twice that found in the health education group. Tai Chi alone induced an increase in VZV-CMI that was comparable in magnitude with that induced by varicella vaccine, and the two were additive; Tai Chi, together with vaccine, produced a substantially higher level of VZV-CMI than vaccine alone. The Tai Chi group also showed significant improvements in SF-36 scores for physical functioning, bodily pain, vitality, and mental health ($P < .05$). **CONCLUSION:** Tai Chi augments resting levels of VZV-specific CMI and boosts VZV-CMI of the varicella vaccine.

Katz, A. R. (2008). "Reduced falls in the elderly: tai chi or placebo or Hawthorne effect?" J Am Geriatr Soc **56**(4): 776-7; author reply 777.

Kerr, C. E., J. R. Shaw, et al. (2008). "Tactile acuity in experienced Tai Chi practitioners: evidence for use dependent plasticity as an effect of sensory-attentional training." Exp Brain Res **188**(2): 317-22.

The scientific discovery of novel training paradigms has yielded better understanding of basic mechanisms underlying cortical plasticity, learning and development. This study is a first step in evaluating Tai Chi (TC), the Chinese slow-motion meditative exercise, as a training paradigm that, while not engaging in direct tactile stimulus training, elicits enhanced tactile acuity in long-term practitioners. The rationale for this study comes from the fact that, unlike previously studied direct-touch tactile training paradigms, TC practitioners focus specific mental attention on the body's extremities including the fingertips and hands as they perform their slow routine. To determine whether TC is associated with enhanced tactile acuity, experienced adult TC practitioners were recruited and compared to age-gender matched controls. A blinded assessor used a validated method (Van Boven et al. in *Neurology* 54(12): 2230-2236, 2000) to compare TC practitioners' and controls' ability to discriminate between two different orientations (parallel and horizontal) across different grating widths at the fingertip. Study results showed that TC practitioners' tactile spatial acuity was superior to that of the matched controls ($P < 0.04$). There was a trend showing TC may have an enhanced effect on older practitioners ($P < 0.066$), suggesting that TC may slow age related decline in this measure. To the best of our knowledge, this is the first study to evaluate a long-term attentional practice's effects on a perceptual measure. Longitudinal studies are needed to examine whether TC initiates or is merely correlated with perceptual changes and whether it elicits long-term plasticity in primary sensory cortical maps. Further studies should also assess whether related somatosensory attentional practices (such as Yoga, mindfulness meditation and Qigong) achieve similar effects.

Kin, S., K. Toba, et al. (2007). "[Health-related quality of life (HRQOL) in older people practicing Tai Chi--comparison of the HRQOL with the national standards for age-matched controls]." Nippon Ronen Igakkai Zasshi **44**(3): 339-44.

AIM: We assessed health-related quality of life (HRQOL) of community-dwelling older people who practiced Tai Chi in a cross-sectional study using the MOS 36-item short-form health survey (SF-36, Japanese version). METHODS: SF-36 and another questionnaire about age, sex, experience with Tai Chi, were distributed to 903 people who were above 65 years old and belonged to the Japan Health Tai Chi Association. Of these, 804 people responded (89.04%). From the SF-36, we used the sub-scores for physical functioning (PF), physical role (PR), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). These sub-scores were compared with those obtained from age-matched national standards for groups 60 to 69 years old and 70 to 80 years old respectively ($n=1.040$). RESULTS: The 60- to 69-year-old subjects had significantly higher PF ($p<0.01$), GH ($p<0.05$), and MH ($p<0.01$) than the national averages. For the 70- to 80-year old subjects, PF ($p<0.01$), PR ($p<0.01$), BP ($p<0.05$), GH ($p<0.01$), VT ($p<0.01$), RE ($p<0.01$), and MH ($p<0.01$) were significantly higher than the national averages. The number of years and the

frequency of practicing Tai Chi statistically significantly correlated with MH and PF, and GH and PF, respectively. CONCLUSION: The HRQOL of the people who practiced Tai Chi was better than age-matched national standards. Although the number of years and the frequency of practicing Tai chi statistically significantly correlated with the sub-scores of the HRQOL, the adjusted (R(2)) were low.

Klein, P. J. (2008). "Tai Chi Chuan in the management of Parkinson's disease and Alzheimer's disease." Med Sport Sci **52**: 173-81.

BACKGROUND: Parkinson's disease (PD) and Alzheimer's disease (ALZ) represent later-life onset neurodegenerative disorders that gradually rob those afflicted of their quality of life. PURPOSE: This chapter offers practice-based recommendations on how instruction and practice of Tai Chi Chuan (TCC) can be adapted for individuals with PD and those with ALZ. RESEARCH EVIDENCE: Practice of TCC is widely advocated as an exercise option in PD; however, little validating research exists. Even less is known about feasibility of applications of TCC for individuals with ALZ. CLINICAL IMPRESSIONS: The slow, rhythmic pace of functionally based exercises, internal organ stimulation, flexibility maintenance, balance-training effects, and general health benefits of TCC and Tai Chi-like exercise practice have clinical relevance for both conditions. Falls prevention, tremor reduction and motor control may be of most importance in management of PD. Behavioral and general health benefits as well as slowing of functional and cognitive decline are considerations with ALZ. RECOMMENDATIONS: Strategies of exercise adaptation include use of Tai Chi-like exercise for individuals with ALZ and those in middle or late stages of PD as well as providing instructional resources and training for caregivers and exercise aides to facilitate practice as a part of daily life.

Kutner, N. G. (2007). "How can exercise be incorporated into the routine care of patients on dialysis?" Int Urol Nephrol **39**(4): 1281-5.

Regular physical activity and exercise can have many beneficial effects for dialysis patients. The provision of an opportunity for patients to exercise at their treatment center has several advantages, but almost any method of increasing activity is likely to be beneficial. In addition to in-center programs such as cycling exercise before or during dialysis, other exercise options include participation in community-based walking programs, water exercise or swimming, yoga, Tai Chi, or low-level strengthening programs. Physical therapy that is individualized to meet patients' needs is also especially appropriate for older persons. The essential condition is that the unit and staff are committed to a treatment culture that makes physical activity a priority. Asking patients what they are doing for regular exercise should be part of routine patient assessment.

Lan, C., S. Y. Chen, et al. (2008). "The exercise intensity of Tai Chi Chuan." Med Sport Sci **52**: 12-9.

Tai Chi Chuan (TC) is a Chinese conditioning exercise and is well-known for its graceful movement. The exercise intensity of TC depends on its training style, posture and duration. Variation in training approaches result in substantial

differences in exercise intensity. We have measured heart rate (HR) and oxygen uptake (VO₂) simultaneously during classical Yang TC practice in 15 male subjects, their heart rate (HR) during TC practice was 58% of the heart rate reserve (HRR), and oxygen uptake (VO₂) was 55% of the peak oxygen uptake (VO_{2peak}). The level of blood lactate immediately after TC practice was 3.8mM, which reflected the level of lactate during TC approximated the onset of blood lactate accumulation (OBLA). In order to evaluate the relative exercise intensity of classical Yang TC, we measured HR responses during TC practice in 100 subjects with age of 25-80 yrs (M/F: 54/46). They were separated into three groups: young (25-44 y/o), middle-aged (45-64 y/o) and elderly (65-80 y/o). During the TC practice, the mean HR of men was 141 +/- 12, 132 +/- 9 and 120 +/- 10 bpm in the young, middle-aged and elderly groups, respectively. Meanwhile, the mean HR of women was 136 +/- 10, 126 +/- 11 and 115 +/- 12 bpm in the young, middle-aged and elderly groups, respectively. Men practiced TC with mean HR corresponding to 57.8 +/- 3.7, 56.6 +/- 3.4 and 55.1 +/- 3.1% of heart rate reserve (HRR) in the three groups; while that of women corresponding to 52.7 +/- 2.8, 51.5 +/- 2.6, and 50.3 +/- 2.9% of HRR in the three age groups. The results demonstrate that classical Yang TC is an exercise with moderate intensity, and its exercise intensity is similar across different ages in each gender.

Lan, C., S. Y. Chen, et al. (2008). "Tai Chi training for patients with coronary heart disease." Med Sport Sci **52**: 182-94.

Coronary heart disease (CHD) is the leading cause of death in the developed countries and many developing countries. Exercise training is the cornerstone of cardiac rehabilitation program for patients with CHD, and exercise intensities in the 50-70% heart rate reserve have been shown to improve functional capacity. However, recent studies found exercise with lower intensity also displayed benefits to CHD patients, and increased the acceptance of exercise program, particularly unfit and elderly patients. Tai Chi Chuan (TC) is a traditional conditioning exercise in the Chinese community, and recently it has become more popular in the Western societies. The exercise intensity of TC is low to moderate, depending on the training style, posture and duration. Participants can choose to perform a complete set of TC or selected movements according to their needs. Previous research substantiates that TC enhances aerobic capacity, muscular strength, endothelial function and psychological wellbeing. In addition, TC reduces some cardiovascular risk factors, such as hypertension and dyslipidemia. Recent studies have also proved that TC is safe and effective for patients with myocardial infarction, coronary bypass surgery and heart failure. Therefore, TC may be prescribed as an alternative exercise program for selected patients with cardiovascular diseases. In conclusion, TC has potential benefits for patients with CHD, and is appropriate for implementation in the community.

Langhorst, J., W. Hauser, et al. (2008). "[Alternative and complementary therapies in fibromyalgia syndrome]." Schmerz **22**(3): 324-33.

INTRODUCTION: Interdisciplinary S3 level guidelines were devised in cooperation with 8 medical, 2 psychological and 2 patient support groups. Results were

elaborated in a multilevel group process. METHODS: On the bases of the "Cochrane Library" (1993-2006), "Medline" (1980-2006), "PsychInfo" (2006) and "Scopus" (2006) controlled studies and meta-analyses of controlled studies were analyzed. RESULTS: Only few controlled studies were found supporting in part the effectiveness of CAM therapies in the treatment of fibromyalgia syndrome. Due to the lack of information on long term efficacy and cost-effectiveness, only limited recommendations for CAM therapies can be given. CONCLUSION: Within a multicomponent therapy setting, selective CAM therapies (acupuncture, vegetarian diet, homeopathy, Tai Chi, Qi Gong, music-oriented and body-oriented therapies) can be recommended for a limited period of time.

Lee, H. Y. and K. J. Lee (2008). "[Effects of Tai Chi exercise in elderly with knee osteoarthritis]." Taehan Kanho Hakhoe Chi **38**(1): 11-8.

PURPOSE: This study was to determine whether the Sun-style 24 forms of Tai Chi exercise improve pain, stiffness, disability, knee joint motion, mobility, balance or falling. METHOD: Forty-six community-dwelling elderly subjects (mean age, 75.46 +/- 6.28) voluntarily participated in an intervention group of either 24 forms of Sun-style Tai Chi for 60 min, 2 times per week for 12 weeks or a control group. A non-equivalent pretest-posttest design was used. Independent t-test and ANCOVA were used to examine group differences by using SPSS12.0. RESULT: The experimental group had significantly less pain ($F=7.60$, $p=.008$) and stiffness ($t=-3.19$, $p=.003$) than the control group. Also there were significant improvements in knee joint motion on the right knee ($t=2.44$, $p=.019$), left knee ($t=2.30$, $p=.026$), rising time ($F=8.03$, $p=.07$), balance on the left single leg test ($t=2.20$, $p=.033$), and fear of falling ($t=-2.33$, $p=.024$) in the Tai Chi exercise group. No significant group differences were found in disability and falls efficacy. CONCLUSION: The Sun-style 24 forms Tai Chi exercise is effective in decreasing pain, stiffness, fear of falling and it improves balance, rising time, and knee joint motion. We suggest a continuing long term intervention to decrease disability and increase efficacy concerning falls.

Lee, L. Y., D. T. Lee, et al. (2007). "Effect of Tai Chi on state self-esteem and health-related quality of life in older Chinese residential care home residents." J Clin Nurs **16**(8): 1580-2.

Lee, M. S., P. Lam, et al. (2008). "Effectiveness of tai chi for Parkinson's disease: A critical review." Parkinsonism Relat Disord.

The objective of this review is to assess the effectiveness of tai chi as a treatment option for Parkinson's disease (PD). We have searched the literature using 21 databases from their inceptions to January 2008, without language restrictions. We included all types of clinical studies regardless of their design. Their methodological quality was assessed using the modified Jadad score. Of the seven studies included, one randomised clinical trial (RCT) found tai chi to be superior to conventional exercise in terms of the Unified PD Rating Scale (UPDRS) and prevention of falls. Another RCT found no effects of tai chi on locomotor ability compared with qigong. The third RCT failed to show effects of tai chi on the UPDRS and the PD

Questionnaires compared with wait list control. The remaining studies were either non-randomised (n=1) or uncontrolled clinical trials (n=3). Collectively these data show that RCTs of the tai chi for PD are feasible but scarce. Most investigations suffer from methodological flaws such as inadequate study design, poor reporting of results, small sample size, and publication without appropriate peer review process. In conclusion, the evidence is insufficient to suggest tai chi is an effective intervention for PD. Further research is required to investigate whether there are specific benefits of tai chi for people with PD, such as its potential effect on balance and on the frequency of falls.

Lee, M. S., M. H. Pittler, et al. (2007). "Is Tai Chi an effective adjunct in cancer care? A systematic review of controlled clinical trials." Support Care Cancer **15**(6): 597-601.

BACKGROUND: Tai chi is a form of complementary and alternative medicine with similarities to aerobic exercises, which has been recommended for relieving cancer-related symptoms. The aim of this systematic review is to summarize and critically evaluate the evidence available from controlled clinical trials of tai chi as a supportive therapy for cancer patients. **METHODS:** We have searched the literature using 19 databases from their respective inceptions through October 2006, without language restrictions. Methodological quality was assessed using Jadad score. **RESULTS:** The searches identified 27 potentially relevant studies. Three randomised clinical trials (RCTs) and one non-randomised controlled trial (CCT) met our inclusion criteria. All of these trials assessed patients with breast cancer. Two RCTs reported significant differences in psychological and physiological symptoms compared to psychosocial support control. Most trials suffered from methodological flaws such as small sample size, inadequate study design and poor reporting. **CONCLUSION:** The evidence is not convincing enough to suggest that tai chi is an effective supportive treatment for cancer. Further research should attempt to answer the many open questions related to the usefulness of tai chi for supportive cancer care.

Lee, M. S., M. H. Pittler, et al. (2007). "Tai chi for rheumatoid arthritis: systematic review." Rheumatology (Oxford) **46**(11): 1648-51.

The objective of this systematic review is to evaluate data from controlled clinical trials testing the effectiveness of tai chi for treating rheumatoid arthritis (RA). Systematic searches were conducted on Medline, Pubmed, AMED, British Nursing Index, CINAHL, EMBASE, PsycInfo, The Cochrane Library 2007, Issue 1, the UK National Research Register and ClinicalTrials.gov, Korean medical databases, Qigong and Energy Medicine Database and Chinese databases up to January 2007. Hand-searches included conference proceedings and our own files. There were no restrictions regarding the language of publication. All controlled trials of tai chi for patients with RA were considered for inclusion. Methodological quality was assessed using the Jadad score. The searches identified 45 potentially relevant studies. Two randomized clinical trials (RCTs) and three non-randomized controlled clinical trials (CCTs) met all inclusion criteria. The included RCTs reported some positive findings for tai chi on disability index, quality of life, depression and mood for RA patients.

Two RCTs assessed pain outcomes and did not demonstrate effectiveness on pain reduction compared with education plus stretching exercise and usual activity control. The extent of heterogeneity in these RCTs prevented a meaningful meta-analysis. Currently there are few trials testing the effectiveness of tai chi in the management of RA. The studies that are available are of low methodological quality. Collectively this evidence is not convincing enough to suggest that tai chi is an effective treatment for RA. The value of tai chi for this indication therefore remains unproven.

Lee, M. S., M. H. Pittler, et al. (2008). "Tai chi for osteoarthritis: a systematic review." Clin Rheumatol **27**(2): 211-8.

The aim of this study was to evaluate data from controlled clinical trials testing the effectiveness of tai chi for treating osteoarthritis. Systematic searches were conducted on MEDLINE, AMED, British Nursing Index, CINAHL, EMBASE, PsycInfo, The Cochrane Library 2007, Issue 2, the UK National Research Register and ClinicalTrials.gov, Korean medical databases, the Qigong and Energy database and Chinese medical databases (until June 2007). Hand searches included conference proceedings and our own files. There were no restrictions regarding the language of publication. All controlled trials of tai chi for patients with osteoarthritis were considered for inclusion. Methodological quality was assessed using the Jadad score. Five randomised clinical trials (RCTs) and seven non-randomised controlled clinical trials (CCTs) met all inclusion criteria. Five RCTs assessed the effectiveness of tai chi on pain of osteoarthritis (OA). Two RCTs suggested significant pain reduction on visual analog scale or Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) compared to routine treatment and an attention control program in knee OA. Three RCTs did not report significant pain reduction on multiple sites pain. Four RCTs tested tai chi for physical functions. Two of these RCTs suggested improvement of physical function on activity of daily living or WOMAC compared to routine treatment or wait-list control, whilst two other RCTs failed to do so. In conclusion, there is some encouraging evidence suggesting that tai chi may be effective for pain control in patients with knee OA. However, the evidence is not convincing for pain reduction or improvement of physical function. Future RCTs should assess larger patient samples for longer treatment periods and use appropriate controls.

Lee, M. S., M. H. Pittler, et al. (2008). "Tai chi for Type 2 diabetes: a systematic review." Diabet Med **25**(2): 240-1.

Lee, M. S., M. H. Pittler, et al. (2008). "Tai chi for osteoporosis: a systematic review." Osteoporos Int **19**(2): 139-46.

INTRODUCTION: Tai chi may have beneficial effects with respect to balance, falls and non-vertebral fractures. The purpose of this systematic review was to evaluate evidence from controlled clinical trials testing the effectiveness of tai chi for osteoporosis. **METHODS:** Systematic searches were conducted on 20 electronic databases. The outcome measures considered for inclusion were changes in bone parameters. **RESULTS:** Five randomized clinical trials (RCTs) and two controlled

clinical trials (CCT) met all inclusion criteria. In postmenopausal women, one RCT found tai chi to be superior for loss of bone mineral density (BMD) compared with sedentary lifestyle, while two other RCTs found no differences between tai chi and exercises or calcium supplementation for BMD. The meta-analysis showed no significant effect of tai chi on BMD change at the spine compared with no treatment in postmenopausal women. One RCT failed to show favorable effects of tai chi compared with resistance training (RT) for total hip BMD in elderly women. A further RCT compared tai chi with RT on bone metabolism and reported favorable effects compared with RT in the elderly. CONCLUSION: The evidence for tai chi in the prevention or treatment of osteoporosis is not convincing. More rigorous research seems warranted.

Lee, M. S., M. H. Pittler, et al. (2007). "Tai chi for cardiovascular disease and its risk factors: a systematic review." J Hypertens **25**(9): 1974-5.

Li, F., P. Harmer, et al. (2007). "Tai Chi-based exercise for older adults with Parkinson's disease: a pilot-program evaluation." J Aging Phys Act **15**(2): 139-51.

The primary objective of this study was to provide preliminary evaluation of the feasibility, safety, and efficacy of a newly developed Tai Chi-based exercise program for older adults with Parkinson's disease (PD). Using a one-group pretest-posttest design, 17 community-dwelling adults (mean age 71.51 years) with mild to moderate idiopathic PD (Stage I, II, or III on the Hoehn and Yahr scale) and stable medication use completed a 5-day, 90-min/day Tai Chi exercise-evaluation program. Outcome measures included face-to-face exit interviews on appropriateness and safety and physical performance (i.e., 50-ft speed walk, up-and-go, functional reach). At the end of this brief intervention, exercise adherence was 100% and the program was shown to be safe. Exit interviews indicated that the program was well received by all participants with respect to program appropriateness, participant satisfaction and enjoyment, and intentions to continue. Furthermore, a significant pretest-to-posttest change was observed at the end of the 5-day program in all three physical-performance measures ($p < .05$). The results of this pilot evaluation suggest that Tai Chi is an appropriate physical activity for older adults with PD and might also be useful as a therapeutic exercise modality for improving and maintaining physical function. These preliminary findings warrant further investigation.

Li, F., P. Harmer, et al. (2008). "Translation of an effective tai chi intervention into a community-based falls-prevention program." Am J Public Health **98**(7): 1195-8.

Tai chi--moving for better balance, a falls-prevention program developed from a randomized controlled trial for community-based use, was evaluated with the re-aim framework in 6 community centers. The program had a 100% adoption rate and 87% reach into the target older adult population. All centers implemented the intervention with good fidelity, and participants showed significant improvements in health-related outcome measures. This evidence-based tai chi program is practical to disseminate and can be effectively implemented and maintained in community settings.

Li, F., P. Harmer, et al. (2008). "Tai Chi: moving for better balance -- development of a community-based falls prevention program." J Phys Act Health **5**(3): 445-55.

BACKGROUND: This study was designed to develop an evidence- and community based falls prevention program -- Tai Chi: Moving for Better Balance. **METHODS:** A mixed qualitative and quantitative approach was used to develop a package of materials for program implementation and evaluation. The developmental work was conducted in 2 communities in the Pacific Northwest. Participants included a panel of experts, senior service program managers or activity coordinators, and older adults. Outcome measures involved program feasibility and satisfaction. **RESULTS:** Through an iterative process, a program package was developed. The package contained an implementation plan and class training materials (ie, instructor's manual, videotape, and user's guidebook). Pilot testing of program materials showed that the content was appropriate for the targeted users (community-living older adults) and providers (local senior service organizations). A feasibility survey indicated interest and support from users and providers for program implementation. A 2-week pilot evaluation showed that the program implementation was feasible and evidenced good class attendance, high participant satisfaction, and interest in continuing Tai Chi. **CONCLUSIONS:** The package of materials developed in this study provides a solid foundation for larger scale implementation and evaluation of the program in community settings.

Li, J. X., D. Q. Xu, et al. (2008). "Effects of 16-week Tai Chi intervention on postural stability and proprioception of knee and ankle in older people." Age Ageing.

OBJECTIVES: to examine the effects of 16-week Tai Chi intervention on postural stability and proprioceptive function in elderly peoples. **METHODS:** 50 elderly people were randomly divided in Tai Chi (25) and control (25) groups. Kinesthesia of knee and ankle joints and duration of single-leg and double-leg stance were measured. **RESULTS:** Tai Chi intervention improved the kinesthesia of knee flexion and extension and single-leg stance with eyes open. **Suggestions:** to improve kinesthesia of ankle joint and stance with eyes closed, a longer period of Tai Chi exercise is needed.

Li, J. X., D. Q. Xu, et al. (2008). "Tai Chi exercise and proprioception behavior in old people." Med Sport Sci **52**: 77-86.

Eighty subjects aged over 60 participated in this study. Ankle and knee joint kinesthesia were measured in 21 long-term TC practitioners (TC group), 20 long-term swimming/running exercisers (S/R group), and 27 sedentary controls (control group). The results showed that ankle joint kinesthesia significantly differed among the three groups ($p = 0.001$). TC practitioners could detect a significantly smaller amount of motion than could the S/R exercisers ($p = 0.022$) and sedentary counterparts ($p = 0.001$). No significant difference was found between the S/R group and the sedentary control group ($p = 0.701$). For the knee joint, the threshold for detection of passive motion was significantly different in knee extension and flexion. For knee flexion, the TC group showed a significantly smaller mean threshold for detection of passive motion than did the subjects in the control

group ($p = 0.026$). There were no significant differences between the S/R group and the control group ($p = 0.312$), the TC group and S/R group ($p = 0.533$). For knee extension, no significant difference was noted among the three groups ($p = 0.597$).

Li, Y., C. N. Devault, et al. (2007). "Effects of extended Tai Chi intervention on balance and selected motor functions of the elderly." Am J Chin Med **35**(3): 383-91.

Balance ability decreases with age, which results in an increased risk of falls for people over age 65. Tai Chi exercise appears to offer potential benefits in the reduction of falls for the elderly. The purpose of the present study was to examine the effects of extended (6- and 12-month) Tai Chi exercise interventions on balance and selected motor functions for senior citizens. Forty-seven subjects were recruited from two local senior centers. Twenty of them ($M = 71.8$ years, $SD = 7.1$), 11 in the Tai Chi exercise group and 9 in the control group, completed the pre-, mid- and post-tests over 12 months on five selected functional performance tests: static balance, dynamic balance, choice reaction time, heel-rise strength, and ankle flexibility. The Tai Chi group was provided with a one-hour Tai Chi exercise session per week for 12 months; the control group did not participate in any exercise program. Results showed that static balance improved significantly after a 6-month Tai Chi intervention. Moreover, the Tai Chi group maintained a higher level in the test performance compared with the control group at the end of the 12-month intervention, but there was no significant difference between the two groups. Data suggested that Tai Chi exercise intervention could produce a positive influence on balance control for the elderly over a prolonged period, but not on muscle strength and ankle flexibility.

Low, S., L. W. Ang, et al. (2008). "A systematic review of the effectiveness of Tai Chi on fall reduction among the elderly." Arch Gerontol Geriatr.

Falls among the elderly is a major public health concern. There has been recent extensive research on the effects of Tai Chi in fall prevention among the elderly. As such, we undertook a systematic review to look for evidence on the effect of this intervention. There were seven randomized controlled trials, which met our objective and inclusion criteria. Our review has shown that Tai Chi has the potential to reduce falls or risk of falls among the elderly, provided that they are relatively young and non-frail. Further review is needed to look into the non-English studies, which assess the effectiveness of Tai Chi on fall reduction.

Lui, P. P., L. Qin, et al. (2008). "Tai Chi Chuan exercises in enhancing bone mineral density in active seniors." Clin Sports Med **27**(1): 75-86, viii.

Osteoporosis is a silent, systemic, chronic disease characterized by low bone mass and structural deterioration of bone tissue. Its clinical and public health implications are substantial because of the mortality, morbidity, and medical care cost associated with osteoporotic fractures. Although estrogen-replacement therapy or anti-bone resorptive drugs can prevent postmenopausal bone loss, they also show

side effects. Physical activity is a nonpharmacological approach for prevention of osteoporosis. Among different types of physical activities, Tai Chi Chuan (TCC) is a low- to moderate-intensity exercise particularly suitable for the elderly, and has been practiced by Chinese for centuries. This article reviews the benefits of TCC for the prevention of osteoporosis and falls by retarding bone loss, improving neuromuscular coordination, and promoting general health.

Maciaszek, J., W. Osinski, et al. (2007). "Effect of Tai Chi on body balance: randomized controlled trial in men with osteopenia or osteoporosis." Am J Chin Med **35**(1): 1-9.

The purpose of this study was to assess the effect of 18-week Tai Chi training on body balance in dynamic trial among elderly men. The study covered 49 subjects from age 60 to 82.1 years, who had osteopenia or osteoporosis. The subjects were recruited from the community by direct mailings and community efforts to participate in studies. The participants were randomly assigned to either the exercise intervention (n = 25) or control groups (n = 24). The Tai Chi group participated in an 18-week exercise class held for 45 min, twice a week. Body balance was assessed using a Computer Posturographic System PE 90 produced by the Military Institute of Aviation Medicine in Warsaw with modified software made in Pro-Med. During the measurement of body balance, the capacity to perform specific tasks was analyzed (deflections in the set scope and direction). In the Tai Chi group, an increase ($p < \text{or} = 0.01$) in effectiveness of balance task performance was noted from 80.95% to 84.45% after the training. In the control group, no statistically significant improvement in the level of body balance was found in the same period. Thus, an 18-week period of Tai Chi exercises twice a week for 45 min is beneficial for dynamic balance. It can be important for reducing fall risk factors.

Mackintosh, S. (2008). "Hydrotherapy and Tai Chi each provide clinical improvements for older people with osteoarthritis." Aust J Physiother **54**(2): 143.

Mariano, C. (2008). "A 16-week tai chi programme prevented falls in healthy older adults." Evid Based Nurs **11**(2): 60.

McCain, N. L., D. P. Gray, et al. (2008). "A randomized clinical trial of alternative stress management interventions in persons with HIV infection." J Consult Clin Psychol **76**(3): 431-41.

Research in psychoneuroimmunology suggests that immunosuppression associated with perceived stress may contribute to disease progression in persons with HIV infection. While stress management interventions may enhance immune function, few alternative approaches have yet been tested. This randomized clinical trial was conducted to test effects of three 10-week stress management approaches-- cognitive-behavioral relaxation training (RLXN), focused tai chi training (TCHI), and spiritual growth groups (SPRT)--in comparison to a wait-listed control group (CTRL) among 252 individuals with HIV infection. Using repeated measures mixed modeling, the authors found that in comparison to the CTRL group, (a) both the RLXN and TCHI groups used less emotion-focused coping, and (b) all treatment

groups had augmented lymphocyte proliferative function. Despite modest effects of the interventions on psychosocial functioning, robust findings of improved immune function have important clinical implications, particularly for persons with immune-mediated illnesses.

Morone, N. E. and C. M. Greco (2007). "Mind-body interventions for chronic pain in older adults: a structured review." Pain Med **8**(4): 359-75.

STUDY DESIGN: We conducted a structured review of eight mind-body interventions for older adults with chronic nonmalignant pain. **OBJECTIVES:** To evaluate the feasibility, safety, and evidence for pain reduction in older adults with chronic nonmalignant pain in the following mind-body therapies: biofeedback, progressive muscle relaxation, meditation, guided imagery, hypnosis, tai chi, qi gong, and yoga. **METHODS:** Relevant studies in the MEDLINE, PsycINFO, AMED, and CINAHL databases were located. A manual search of references from retrieved articles was also conducted. Of 381 articles retrieved through search strategies, 20 trials that included older adults with chronic pain were reviewed. **RESULTS:** Fourteen articles included participants aged 50 years and above, while only two of these focused specifically on persons aged ≥ 65 years. An additional six articles included persons aged ≥ 50 years. Fourteen articles were controlled trials. There is some support for the efficacy of progressive muscle relaxation plus guided imagery for osteoarthritis pain. There is limited support for meditation and tai chi for improving function or coping in older adults with low back pain or osteoarthritis. In an uncontrolled biofeedback trial that stratified by age group, both older and younger adults had significant reductions in pain following the intervention. Several studies included older adults, but did not analyze benefits by age. Tai chi, yoga, hypnosis, and progressive muscle relaxation were significantly associated with pain reduction in these studies. **CONCLUSION:** The eight mind-body interventions reviewed are feasible in an older population. They are likely safe, but many of the therapies included modifications tailored for older adults. There is not yet sufficient evidence to conclude that these eight mind-body interventions reduce chronic nonmalignant pain in older adults. Further research should focus on larger, clinical trials of mind-body interventions to answer this question.

Mustian, K. M., O. G. Palesh, et al. (2008). "Tai Chi Chuan for breast cancer survivors." Med Sport Sci **52**: 209-17.

BACKGROUND/AIMS: Treatment for breast cancer produces side effects that diminish functional capacity and quality of life (QOL) among survivors. Tai Chi Chuan (TCC) is a moderate form of exercise that may improve functional capacity and QOL in these individuals. Women who completed treatment for breast cancer were randomized to receive TCC or psychosocial support therapy for 12 weeks (60 min; three times weekly). **RESULTS:** The TCC group demonstrated significant improvements in functional capacity, including aerobic capacity, muscular strength, and flexibility, as well as QOL; the psychosocial support therapy group showed significant improvements only in flexibility, with declines in aerobic capacity, muscular strength, and QOL. **CONCLUSIONS:** The TCC group exhibited significant

improvements in functional capacity and QOL. These data suggest that TCC may enhance functional capacity and QOL among breast cancer survivors.

Nnodim, J. O., D. Strasburg, et al. (2006). "Dynamic balance and stepping versus tai chi training to improve balance and stepping in at-risk older adults." J Am Geriatr Soc **54**(12): 1825-31.

OBJECTIVES: To compare the effect of two 10-week balance training programs, Combined Balance and Step Training (CBST) versus tai chi (TC), on balance and stepping measures. **DESIGN:** Prospective intervention trial. **SETTING:** Local senior centers and congregate housing facilities. **PARTICIPANTS:** Aged 65 and older with at least mild impairment in the ability to perform unipedal stance and tandem walk. **INTERVENTION:** Participants were allocated to TC (n = 107, mean age 78) or CBST, an intervention focused on improving dynamic balance and stepping (n = 106, mean age 78). **MEASUREMENTS:** At baseline and 10 weeks, participants were tested in their static balance (Unipedal Stance and Tandem Stance (TS)), stepping (Maximum Step Length, Rapid Step Test), and Timed Up and Go (TUG). **RESULTS:** Performance improved more with CBST than TC, ranging from 5% to 10% for the stepping tests (Maximum Step Length and Rapid Step Test) and 9% for TUG. The improvement in TUG represented an improvement of more than 1 second. Greater improvements were also seen in static balance ability (in TS) with CBST than TC. **CONCLUSION:** Of the two training programs, in which variants of each program have been proven to reduce falls, CBST results in modest improvements in balance, stepping, and functional mobility versus TC over a 10-week period. Future research should include a prospective comparison of fall rates in response to these two balance training programs.

Ospina, M. B., K. Bond, et al. (2007). "Meditation practices for health: state of the research." Evid Rep Technol Assess (Full Rep)(155): 1-263.

OBJECTIVES: To review and synthesize the state of research on a variety of meditation practices, including: the specific meditation practices examined; the research designs employed and the conditions and outcomes examined; the efficacy and effectiveness of different meditation practices for the three most studied conditions; the role of effect modifiers on outcomes; and the effects of meditation on physiological and neuropsychological outcomes. **DATA SOURCES:** Comprehensive searches were conducted in 17 electronic databases of medical and psychological literature up to September 2005. Other sources of potentially relevant studies included hand searches, reference tracking, contact with experts, and gray literature searches. **REVIEW METHODS:** A Delphi method was used to develop a set of parameters to describe meditation practices. Included studies were comparative, on any meditation practice, had more than 10 adult participants, provided quantitative data on health-related outcomes, and published in English. Two independent reviewers assessed study relevance, extracted the data and assessed the methodological quality of the studies. **RESULTS:** Five broad categories of meditation practices were identified (Mantra meditation, Mindfulness meditation, Yoga, Tai Chi, and Qi Gong). Characterization of the universal or supplemental components of meditation practices was precluded by the theoretical and

terminological heterogeneity among practices. Evidence on the state of research in meditation practices was provided in 813 predominantly poor-quality studies. The three most studied conditions were hypertension, other cardiovascular diseases, and substance abuse. Sixty-five intervention studies examined the therapeutic effect of meditation practices for these conditions. Meta-analyses based on low-quality studies and small numbers of hypertensive participants showed that TM(R), Qi Gong and Zen Buddhist meditation significantly reduced blood pressure. Yoga helped reduce stress. Yoga was no better than Mindfulness-based Stress Reduction at reducing anxiety in patients with cardiovascular diseases. No results from substance abuse studies could be combined. The role of effect modifiers in meditation practices has been neglected in the scientific literature. The physiological and neuropsychological effects of meditation practices have been evaluated in 312 poor-quality studies. Meta-analyses of results from 55 studies indicated that some meditation practices produced significant changes in healthy participants. CONCLUSIONS: Many uncertainties surround the practice of meditation. Scientific research on meditation practices does not appear to have a common theoretical perspective and is characterized by poor methodological quality. Firm conclusions on the effects of meditation practices in healthcare cannot be drawn based on the available evidence. Future research on meditation practices must be more rigorous in the design and execution of studies and in the analysis and reporting of results.

Pei, Y. C., S. W. Chou, et al. (2008). "Eye-hand coordination of elderly people who practice Tai Chi Chuan." J Formos Med Assoc **107**(2): 103-10.

BACKGROUND/PURPOSE: The objective of this study was to evaluate the effect of motor control from Tai Chi Chuan (TCC) on eye-hand coordination in the elderly. METHODS: Forty-two elderly people were recruited into this study. People in the TCC group (n = 22) had been practicing TCC regularly for more than 3 years. The control group (n = 20) comprised healthy and active elderly people. Subjects were asked to stroke target sensors in a test device with computer recording. There were three different target sensor sizes (1 cm, 1.5 cm and 2 cm in diameter) for different tests. For each target stroking, the following were recorded and calculated: start and end positions, duration of movement, pause time, peak velocity, and the time to reach peak velocity. RESULTS: The TCC group showed significantly better results in decrease of displacement (p = 0.003), movement time (p = 0.002), pause time (p < 0.001), number of submovements (p = 0.001), and better skewness coefficients (p < 0.001) than the control group. However, the difference in the peak velocity of the TCC and control groups did not reach statistical significance (p = 0.026). CONCLUSION: The elderly TCC group had better results on the eye-hand coordination test than the control elderly group.

Raingruber, B. and C. Robinson (2007). "The effectiveness of Tai Chi, yoga, meditation, and Reiki healing sessions in promoting health and enhancing problem solving abilities of registered nurses." Issues Ment Health Nurs **28**(10): 1141-55.

Given the current necessity of retaining qualified nurses, a self-care program consisting of Yoga, Tai Chi, Meditation classes, and Reiki healing sessions was

designed for a university-based hospital. The effectiveness of these interventions was evaluated using self-care journals and analyzed using a Heideggerian phenomenological approach. Outcomes of the self-care classes described by nurses included: (a) noticing sensations of warmth, tingling, and pulsation which were relaxing, (b) becoming aware of an enhanced problem solving ability, and (c) noticing an increased ability to focus on patient needs. Hospitals willing to invest in self-care options for nurses can anticipate patient and work related benefits.

Reid, M. C., M. Papaleontiou, et al. (2008). "Self-management strategies to reduce pain and improve function among older adults in community settings: a review of the evidence." Pain Med 9(4): 409-24.

CONTEXT: Self-management strategies for pain hold substantial promise as a means of reducing pain and improving function among older adults with chronic pain, but their use in this age group has not been well defined. OBJECTIVE: To review the evidence regarding self-management interventions for pain due to musculoskeletal disorders among older adults. DESIGN: We searched the Medline and Cumulative Index to Nursing and Allied Health Literature databases to identify relevant articles for review and analyzed English-language articles that presented outcome data on pain, function, and/or other relevant endpoints and evaluated programs/strategies that could be feasibly implemented in the community. Abstracted information included study sample characteristics, estimates of treatment effect, and other relevant outcomes when present. RESULTS: Retained articles (N = 27) included those that evaluated programs sponsored by the Arthritis Foundation and other programs/strategies including yoga, massage therapy, Tai Chi, and music therapy. Positive outcomes were found in 96% of the studies. Proportionate change in pain scores ranged from an increase of 18% to a reduction of 85% (median = 23% reduction), whereas change in disability scores ranged from an increase of 2% to a reduction of 70% (median = 19% reduction). Generalizability issues identified included limited enrollment of ethnic minority elders, as well as non-ethnic elders aged 80 and above. CONCLUSIONS: Our results suggest that a broad range of self-management programs may provide benefits for older adults with chronic pain. Research is needed to establish the efficacy of the programs in diverse age and ethnic groups of older adults and identify strategies that maximize program reach, retention, and methods to ensure continued use of the strategies over time.

Richerson, S. and K. Rosendale (2007). "Does Tai Chi improve plantar sensory ability? A pilot study." Diabetes Technol Ther 9(3): 276-86.

BACKGROUND: Aging adversely affects balance and increases the propensity to slip and fall. Loss of plantar sensation due to diabetic peripheral neuropathy and other diseases has been shown to further increase this propensity to fall. The ancient Chinese art of Tai Chi has been previously shown as a method to improve balance in healthy elderly adults. METHODS: The aim of this study was to determine if Tai Chi intervention improved both balance and plantar sensory perception in healthy elderly adults and elderly adults with diabetes and plantar sensory loss. Elderly subjects (mean +/- SD age = 73.1 +/- 5.9 years, n = 18) were tested for plantar

sensory ability and several balance metrics before Tai Chi training and again after 6 months of weekly sessions. Participants were grouped by initial sensory perception scores (as measured by a vibrometer) in order to make inferences on the effects of Tai Chi on sensory perception. RESULTS: Plantar sensation results show all participants showed significant improvement in sensory ability with the 6 months of Tai Chi training. All groups also had a general improvement in all balance measures, with the greatest improvement seen in those subjects with large sensory losses. Hemoglobin A1C measurements also decreased as a result of the intervention. CONCLUSION: This study demonstrates the effectiveness of Tai Chi training as a method of improving plantar sensation and balance in elderly adults and elderly adults with diabetes with a large plantar sensation loss.

Schmitt, K. and R. W. Kressig (2008). "[Mobility and balance.]." Ther Umsch **65**(8): 421-6.

Quality of life is strongly associated with the mobility of elderly people. Falls often cause restricted mobility, a decline in activities of daily living and an increased risk of institutionalisation. Frailty, commonly associated with aging, is a biologic syndrome of decreased resistance to stressors, resulting from declines across multiple physiological systems. Changes in mobility and gait constitute part of the frailty syndrome. Since more than one third of persons over the age of 65 fall each year, prevention of falls is very important. Already while taking the patients' history special emphasis should be laid on matters associated with an increased risk of falling, such as the use of more than four medications. To assess mobility several brief tests exist (i.e. Timed up & go [17], Walking while Talking [20]) which immediately yield information regarding mobility and falling risk. Patients with poor performance on such tests or those with a history of several falls should undergo a spatio-temporal gait analysis in order to determine a possible cause as well as suitable interventions. Additionally, the objective measurement of temporo-spatial gait parameters under dual task conditions may detect deficits in cognitive function. Several interventions have been shown to have favourable effects on gait stability and the occurrence of falls. Proprioceptive problems can be partially compensated for by wearing special shoes. Also, different movement exercises such as Tai Chi Chuan, Jaques-Dalcroze eurhythmics and social dancing are associated with better balance and gait safety, and a reduction of falls.

Shen, C. L., C. R. James, et al. (2008). "Effects of Tai Chi on gait kinematics, physical function, and pain in elderly with knee osteoarthritis--a pilot study." Am J Chin Med **36**(2): 219-32.

Our previous study has demonstrated that 6 weeks of Tai Chi exercise significantly improves knee pain and stiffness in elderly with knee osteoarthritis. This study also examine the effects of Tai Chi exercise on gait kinematics, physical function, pain, and pain self-efficacy in elderly with knee osteoarthritis. In this prospective, pretest-posttest clinical trial, 40 men and women (64.4+/-8.3 years) diagnosed with knee osteoarthritis participated in 6 weeks of instructed Tai Chi training, 1 hour/session, 2 sessions/week. The following measures were taken at baseline and the conclusion of the intervention: (a) gait kinematics including stride length, stride

frequency, and gait speed quantified using video analysis, (b) physical function, (c) knee pain, and (d) pain self-efficacy. Data were analyzed using repeated MANCOVA, MANOVA, ANOVA and Wilcoxon tests. After 6 weeks of Tai Chi exercise, stride length ($p=0.023$; 1.17 ± 0.17 vs. 1.20 ± 0.14 m), stride frequency ($p=0.014$; 0.91 ± 0.08 vs. 0.93 ± 0.08 strides/s), and consequently gait speed ($p<0.025$; 1.06 ± 0.19 vs. 1.12 ± 0.15 m/s) increased in the participants. Physical function was significantly improved ($p<0.001$) and knee pain was significantly decreased ($p=0.002$), while no change was observed in pain self-efficacy. In conclusion, these findings support that Tai Chi is beneficial for gait kinematics in elderly with knee osteoarthritis, and a longer term application is needed to substantiate the effect of Tai Chi as an alternative exercise in management of knee osteoarthritis.

Shen, C. L., J. S. Williams, et al. (2007). "Comparison of the effects of Tai Chi and resistance training on bone metabolism in the elderly: a feasibility study." Am J Chin Med **35**(3): 369-81.

This feasibility study compared the effects of Tai Chi (TC) and resistance training (RT) on bone metabolism in the elderly. Twenty eight sedentary, elder adults, were randomized into either TC ($n = 14$, 78.8 ± 1.3 years) or RT ($n = 14$, 79.4 ± 2.2 years) to participate in 40 min of exercise per session, 3 sessions/week for 24 weeks. The outcome measures assessed were the concentrations of serum bone-specific alkaline phosphatase (BAP), pyridinoline (PYD), parathyroid hormone (PTH) and calcium, and urinary calcium. The TC group had a higher compliance rate than the RT group. After 6 weeks, (i) both TC and RT resulted in higher level of serum BAP relative to the baseline and the TC group exhibited a greater increase in serum BAP than the RT group; (ii) there was an increase of serum PYD in the RT group only, not in the TC group; and (iii) the BAP/PYD ratio was higher than baseline only in the TC group, and the increase of the ratio in the TC group was greater than that in the RT group. After 12 weeks, the increase in serum PTH in the TC group was higher than the RT group. After 24 weeks, there was a reduction of the urinary calcium level in the TC group relative to the baseline. In conclusion, these findings support that TC is beneficial for increasing bone formation in elderly, and long-term application is needed to substantiate the effect of TC as an alternative exercise in promotion of bone health.

Sjosten, N., S. Vaapio, et al. (2008). "The effects of fall prevention trials on depressive symptoms and fear of falling among the aged: a systematic review." Aging Ment Health **12**(1): 30-46.

Firstly, to explore whether depressive symptoms and fear of falling have been used as outcome measures in fall prevention trials. Secondly, to determine the effects of fall prevention trials on these variables among the aged. A literature search covering various medical databases was conducted to identify randomised controlled trials regarding the effects of fall prevention programmes on depressive symptoms and fear of falling among the aged. The studies were classified according to the intervention method (single/multifactorial) and study results (positive/negative) regarding depressive symptoms or fear of falling. Methodological quality was assessed in relation to blinding at outcome assessment,

follow-up and whether intention-to-treat analysis was used. Depressive symptoms were used as an outcome measure in eight and fear of falling in 21 studies. A multifactorial approach seems the most effective method in reducing fear of falling, while some single methods such as Tai Chi also seem beneficial. Little evidence was found relating to the effects of fall prevention trials on depressive symptoms. Fear of falling may be reduced by fall prevention programmes. More studies assessing the effects on depressive symptoms, especially among the depressed aged are needed.

Sleet, D. A., D. B. Moffett, et al. (2008). "CDC's research portfolio in older adult fall prevention: a review of progress, 1985-2005, and future research directions." J Safety Res **39**(3): 259-67.

PROBLEM: Falls are a leading cause of mortality and morbidity among adults age 65 and older. Population models predict steep increases in the 65 and older population bands in the next 10-15 years and in turn, public health is bracing for increased fall rates and the strain they place on health care systems and society. To assess progress in fall prevention, the Centers for Disease Control and Prevention conducted a research portfolio review to examine the quality, relevance, outcomes and successes of the CDC fall prevention program and its impact on public health. **METHODS:** A peer review panel was charged with reviewing 20 years of funded research and conducting a SWOT (strengths, weaknesses, opportunities, and threats) analysis for extramural and intramural research activities. Information was collected from grantees (via a survey instrument), staff were interviewed, and progress reports and products were reviewed and analyzed. **RESULTS:** CDC has invested over \$24,900,000 in fall-related research and programs over 20 years. The portfolio has had positive impacts on research, policies and programs, increasing the public health injury prevention workforce, and delivering effective fall prevention programs. **DISCUSSION:** Public health agencies, practitioners, and policy makers recognize that while there are some evidence-based older adult fall prevention interventions available, many remain unused or are infeasible to implement. Specific recommendations across the public health model, include: additional research in gathering robust epidemiologic data on trends and patterns of fall-related injuries at all levels; researching risk factors by setting or sub-population; developing and testing innovative interventions; and engaging in translation and dissemination research on best practices to increase uptake and adoption of fall prevention strategies. CDC has responded to a number of suggestions from the portfolio review including: funding translation research of a proven Tai Chi fall intervention; beginning to address gaps in gender, ethnic, and racial differences in falls; and collaborating with partner organizations who share in CDC's mission to improve public health by preventing falls and reducing fall-related injuries. **IMPACT ON INDUSTRY:** Industry has an opportunity to develop more accessible and usable devices to reduce injury from falls (for example, hip protectors and force reducing flooring). By implementing effective, evidence-based interventions to prevent falls and reduce injuries from falls, significant decreases in health care costs can be expected.

Song, R., E. O. Lee, et al. (2007). "Effects of a Sun-style Tai Chi exercise on arthritic symptoms, motivation and the performance of health behaviors in women with osteoarthritis." Taehan Kanho Hakhoe Chi **37**(2): 249-56.

PURPOSE: Tai Chi exercise, an ancient Chinese martial art, has drawn more and more attention for its health benefits. The purpose of the study was to identify the effects of a Sun-style Tai Chi exercise on arthritic symptoms (joint pain and stiffness), motivation for performing health behaviors, and the performance of health behaviors among older women with osteoarthritis. **METHODS:** Total of 72 women with the mean age of 63 years old were recruited from outpatients clinic or public health centers according to the inclusion criteria and assigned randomly to either the Tai Chi exercise group or the control. A Sun-style Tai Chi exercise has been provided three times a week for the first two weeks, and then once a week for another 10 weeks. In 12 weeks of study period, 22 subjects in the Tai Chi exercise group and 21 subjects in the control group completed the posttest measure with the dropout rate of 41%. Outcome variables included arthritic symptoms measured by K-WOMAC, motivation for health behavior, and health behaviors. **RESULTS:** At the completion of the 12 week Tai Chi exercise, the Tai Chi group perceived significantly less joint pain ($t=-2.19$, $p=0.03$) and stiffness ($t=-2.24$, $p=0.03$), perceived more health benefits ($t=2.67$, $p=0.01$), and performed better health behaviors ($t=2.35$, $p=0.02$), specifically for diet behavior ($t=2.06$, $p=0.04$) and stress management ($t=2.97$, $p=0.005$). **CONCLUSION:** A Sun-style Tai Chi exercise was found as beneficial for women with osteoarthritis to reduce their perceived arthritic symptoms, improve their perception of health benefits to perform better health behaviors.

Straus, S. (2008). "A 16-week tai chi programme prevented falls in healthy older adults." Evid Based Med **13**(2): 54.

Takekuma, N., N. L. Rogers, et al. (2007). "Functional fitness gain varies in older adults depending on exercise mode." Med Sci Sports Exerc **39**(11): 2036-43.

Various exercise modes are available to improve functional fitness (FF) in older adults. However, information on the comparative capability of different exercise modes to improve FF is insufficient. **PURPOSE:** To compare the effects of aerobic, resistance, flexibility, balance, and Tai Chi programs on FF in Japanese older adults. **METHODS:** FF was evaluated using a chair stand, arm curl, up and go, sit and reach, back scratch, functional reach, and 12-min walk. One hundred thirteen older adults (73 +/- 6 yr, 64 men, 49 women) volunteered for one of five exercise groups: aerobic (AER), resistance (RES), balance (BAL), flexibility (FLEX), and Tai Chi (T-CHI), or they were assigned to the wait-list control group (CON). Programs were performed for 12 wk, 2 d x wk(-1) (RES, BAL, FLEX, T-CHI) or 3 d x wk(-1) (AER), and 90 min x d(-1). **RESULTS:** Improvement in cardiorespiratory fitness was limited to AER (16%). Improvements in upper- and lower-body strength and balance/agility were outcomes of RES, BAL, and T-CHI. RES elicited the greatest upper-body strength improvement (31%), whereas BAL produced the greatest improvement in lower-body strength (40%). Improvements in balance/agility were similar across RES (10%), BAL (10%), and T-CHI (10%). Functional reach

improved similarly in AER (13%), BAL (16%), and RES (15%). There were no improvements in flexibility. CONCLUSION: Results suggest that a single mode with crossover effects could address multiple components of fitness. Therefore, a well-rounded exercise program may only need to consist of two types of exercise to improve the components of functional fitness. One type should be aerobic exercise, and the second type could be chosen from RES, BAL, and T-CHI.

Taylor-Piliae, R. E. (2008). "The effectiveness of Tai Chi exercise in improving aerobic capacity: an updated meta-analysis." *Med Sport Sci* **52**: 40-53.

PURPOSE: To determine if Tai Chi exercise is effective in improving aerobic capacity. METHODS: A computerized search of seven databases was conducted using the mesh term 'Tai Ji', published between January 1, 2000, and June 1, 2007, in order to update a previous meta-analysis examining the effect of Tai Chi on aerobic capacity. Effect sizes (ESs) and 95% confidence intervals were calculated using D-STAT software. The ES for each study was weighted by the sample size and pooled variance. The effects of Tai Chi exercise on aerobic capacity were calculated including study design, gender, age, and type of comparison group. RESULTS: A total of 170 citations were obtained, with 7 new studies meeting the inclusion criteria and added to studies from the previous meta-analysis. Large significant effects of Tai Chi on aerobic capacity were found for subjects enrolled in the cross-sectional studies (ES = 1.33), in both women and men (1.09 and 0.86, respectively), among adults > or =55 years old (ES = 1.07), and when comparing sedentary subjects with those in Tai Chi exercise groups (ES = 0.99). Small to moderate effects, though nonsignificant, were found for subjects enrolled in the experimental studies (ES = 0.38), adults <55 years old (ES = 0.16), and when comparing subjects participating in other physical activity with those in Tai Chi exercise groups (ES = 0.45). CONCLUSIONS: Tai Chi exercise is effective in improving aerobic capacity when practiced long term. Middle-aged and older women and men benefit most, with greater gains seen among those initially sedentary. Tai Chi can be recommended as an alternative aerobic exercise, particularly among sedentary adults > or =55 years old.

Taylor-Piliae, R. E. and E. S. Froelicher (2007). "Methods to optimize recruitment and retention to an exercise study in Chinese immigrants." *Nurs Res* **56**(2): 132-6.

BACKGROUND: To counter pervasive disparities in healthcare and guide public health prevention programs, culturally sensitive recruitment and retention strategies for Chinese immigrants participating in health-related research studies are needed. OBJECTIVES: The aim of this study was to develop and implement recruitment and retention strategies with Chinese immigrants in a Tai Chi exercise study. METHODS: After substantial project planning and incorporating community-based research principles, a multidimensional approach was used to ensure minimal loss to follow-up. Recruitment strategies included partnering with a community-based agency, distributing study information using a multimedia approach, communicating in the native language, and demonstrating cultural sensitivity. Retention strategies included establishing a tracking method during recruitment, providing personalized feedback, maintaining the same location for all aspects of

the study, eliminating potential linguistic barriers, providing personal attention and encouragement, monitoring attendance, utilizing a charismatic Tai Chi instructor, respecting Chinese culture, providing appropriate incentives, and maintaining good communication. RESULTS: Sixty persons showed interest in the study, 52 persons were screened, and 39 persons were enrolled. Recruitment was completed within 3 weeks. An advertisement in the Chinese newspaper was the most fruitful recruitment source, yielding approximately 60% of the study participants. Retention in the study was also very high (97%, n = 38). DISCUSSION: The successful recruitment and retention of Chinese immigrants in this Tai Chi exercise study are due to a variety of factors on many levels, including the participants, study investigator, and community-based agency.

Taylor-Piliae, R. E. and W. L. Haskell (2007). "Tai Chi exercise and stroke rehabilitation." Top Stroke Rehabil **14**(4): 9-22.

According to reported global estimates, 15 million people suffer from a stroke each year, resulting in 5.5 million deaths, with 5 million left permanently disabled. Typical disabilities following stroke include poor neuromuscular control, hemodynamic imbalance, and negative mood state. Tai Chi (TC) is associated with better balance, lower blood pressure, and improved mood, which are important for stroke survivors. An overview of the philosophy and principles of TC exercise is provided, followed by a literature review of reported TC studies examining balance, blood pressure, and mood. Finally, the potential application of TC exercise to stroke rehabilitation is discussed.

Thornton, E. W. (2008). "Tai Chi exercise in improving cardiorespiratory capacity." Med Sport Sci **52**: 54-63.

INTRODUCTION/PURPOSE: To evaluate evidence relating to effects of Tai Chi on cardiovascular outcomes, with emphasis on randomised control designs. PROCEDURE: Studies reviewed in 2004 were re-examined, together with more recent controlled trials of Tai Chi relating to cardiovascular outcome. The analysis provided comment on problems associated with randomised control design, including sources of bias in such trials. RESULTS: With a single exception, data support reduction of baseline systolic/diastolic blood pressure (BP). While there may be positive bias in these studies, data are from diverse ethnic groups, different gender, age, and level of functional ability. There are no data relating to BP reactive change to subsequent stressors. Few studies consider potential mediating mechanisms through which Tai Chi may provide these benefits. IMPLICATIONS: Caution is advocated in using randomised controlled trials as the only effective type of study. Such designs are difficult to conduct and effective trials are more likely given a better understanding of the mediating mechanism(s) through which benefits may be derived. It is currently unclear how changes in BP are derived. Some data indicate a shift to increased vagal relative to sympathetic dominance and there may be other potential physiological mediators. No study has examined relationships between potential psychological gains such as self-efficacy and BP change, or individual differences in outcomes.

Tsang, T., R. Orr, et al. (2008). "Effects of Tai Chi on glucose homeostasis and insulin sensitivity in older adults with type 2 diabetes: a randomised double-blind sham-exercise-controlled trial." *Age Ageing* **37**(1): 64-71.

BACKGROUND: a large proportion of adults with type 2 diabetes remain sedentary despite evidence of benefits from exercise for type 2 diabetes. Simplified Yang Tai Chi has been shown in one study to have no effect on insulin sensitivity in older adults. However, a modified Tai Chi form, Tai Chi for Diabetes (TCD) has recently been composed, claiming to improve diabetes control. **METHODS:** subjects were randomised to Tai Chi or sham exercise, twice a week for 16 weeks. Primary outcomes were insulin resistance 72 h post-exercise (HOMA2-IR), and long-term glucose control (HbA(1c)). **RESULTS:** thirty-eight subjects (65 +/- 7.8 years, 79% women) were enrolled. Baseline BMI was 32.2 +/- 6.3 kg/m(2), 84% had osteoarthritis, 76% hypertension, and 34% cardiac disease. There was one dropout, no adverse events, and median compliance was 100 (0-100)%. There were no effects of time or group assignment on insulin resistance or HbA(1c) (-0.07 +/- 0.4% Tai Chi versus 0.12 +/- 0.3% Sham; P = 0.13) at 16 weeks. Improvement in HbA(1c) was related to decreased body fat (r = 0.484, P = 0.004) and improvement in insulin resistance was related to decreased body fat (r = 0.37, P = 0.03) and central adiposity (r = 0.38, P = 0.02), as well as increased fat-free mass (r = -0.46, P = 0.005). **CONCLUSIONS:** TCD did not improve glucose homeostasis or insulin sensitivity measured 72 h after the last bout of exercise. More intense forms of Tai Chi may be required to produce the body composition changes associated with metabolic benefits in type 2 diabetes.

Tsang, T., R. Orr, et al. (2007). "Health benefits of Tai Chi for older patients with type 2 diabetes: the "Move It For Diabetes study"--a randomized controlled trial." *Clin Interv Aging* **2**(3): 429-39.

Older adults with type 2 diabetes have mobility impairment and reduced fitness. This study aimed to test the efficacy of the "Tai Chi for Diabetes" form, developed to address health-related problems in diabetes, including mobility and physical function. Thirty-eight older adults with stable type 2 diabetes were randomized to Tai Chi or sham exercise, twice a week for 16 weeks. Outcomes included gait, balance, musculoskeletal and cardiovascular fitness, self-reported activity and quality of life. Static and dynamic balance index (-5.8 +/- 14.2; p = 0.03) and maximal gait speed (6.2 +/- 11.6%; p = 0.005) improved over time, with no significant group effects. There were no changes in other measures. Non-specific effects of exercise testing and/or study participation such as outcome expectation, socialization, the Hawthorne effect, or unmeasured changes in health status or compliance with medical treatment may underlie the modest improvements in gait and balance observed in this sham-exercise-controlled trial. This Tai Chi form, although developed specifically for diabetes, may not have been of sufficient intensity, frequency, or duration to effect positive changes in many aspects of physiology or health status relevant to older people with diabetes.

Tsang, W. W. and C. W. Hui-Chan (2008). "Sensorimotor control of balance: a Tai Chi solution for balance disorders in older subjects." *Med Sport Sci* **52**: 104-14.

BACKGROUND/AIMS: In addition to environmental factors, deteriorating sensorimotor control of balance will predispose older adults to falls. Understanding the aging effects on sensorimotor control of balance performance is important for designing fall prevention programs for older adults. How repeated practice of Tai Chi can improve limb joint proprioception, integration of neural signals in the central nervous system for balance control, and motor output at the level of knee muscles is discussed in this chapter. **RESULTS:** Our previous studies showed that elderly Tai Chi practitioners performed significantly better than elderly nonpractitioners in (1) knee joint proprioception, (2) reduced or conflicting sensory situations that demand more visual or vestibular contributions, (3) standing balance control after vestibular stimulation without visual input, (4) voluntary weight shifting in different directions within the base of support, (5) single-leg stance during perturbations of the support surface, and (6) knee extensor and flexor muscle strength. In a prospective study, we further showed that 4 weeks of daily Tai Chi practice but not general education produced significant improvement in balance performance. **CONCLUSION:** The requirements of Tai Chi for accurate joint positioning and weight transfer involving smooth coordination of neck, trunk, upper and lower limb movements, make it particularly useful for improving the sensorimotor control of balance in the elderly. Because Tai Chi can be practiced any time and anywhere, and is well accepted by older people in both the East and now the West, it is especially suited to be a key component of a low-costing community-based fall prevention program alongside with education about environmental factors.

Voukelatos, A., R. G. Cumming, et al. (2007). "A randomized, controlled trial of tai chi for the prevention of falls: the Central Sydney tai chi trial." J Am Geriatr Soc **55**(8): 1185-91.

OBJECTIVES: To determine the effectiveness of a 16-week community-based tai chi program in reducing falls and improving balance in people aged 60 and older. **DESIGN:** Randomized, controlled trial with waiting list control group. **SETTING:** Community in Sydney, Australia. **PARTICIPANTS:** Seven hundred two relatively healthy community-dwelling people aged 60 and older (mean age 69). **INTERVENTION:** Sixteen-week program of community-based tai chi classes of 1 hour duration per week. **MEASUREMENTS:** Falls during 16 and 24 weeks of follow-up were assessed using a calendar method. Balance was measured at baseline and 16-week follow-up using six balance tests. **RESULTS:** Falls were less frequent in the tai chi group than in the control group. Using Cox regression and time to first fall, the hazard ratio after 16 weeks was 0.72 (95% confidence interval (CI)=0.51-1.01, P=.06), and after 24 weeks it was 0.67 (95% CI=0.49-0.93, P=.02). There was no difference in the percentage of participants who had one or more falls. There were statistically significant differences in changes in balance favoring the tai chi group on five of six balance tests. **CONCLUSION:** Participation in once per week tai chi classes for 16 weeks can prevent falls in relatively healthy community-dwelling older people.

Wahbeh, H., S. M. Elsas, et al. (2008). "Mind-body interventions: applications in neurology." Neurology **70**(24): 2321-8.

OBJECTIVE: Half of the adults in the United States use complementary and alternative medicine with mind-body therapy being the most commonly used form. Neurology patients often turn to their physicians for insight into the effectiveness of the therapies and resources to integrate them into their care. The objective of this article is to give a clinical overview of mind-body interventions and their applications in neurology. **METHODS:** Medline and PsychInfo were searched on mind-body therapies and neurologic disease search terms for clinical trials and reviews and published evidence was graded. **RESULTS:** Meditation, relaxation, and breathing techniques, yoga, tai chi, and qigong, hypnosis, and biofeedback are described. Mind-body therapy application to general pain, back and neck pain, carpal tunnel syndrome, headaches, fibromyalgia, multiple sclerosis, epilepsy, muscular dysfunction, stroke, aging, Parkinson disease, stroke, and attention deficit-hyperactivity disorder are reviewed. **CONCLUSIONS:** There are several conditions where the evidence for mind-body therapies is quite strong such as migraine headache. Mind-body therapies for other neurology applications have limited evidence due mostly to small clinical trials and inadequate control groups.

Wall, R. B. (2008). "Teaching Tai Chi with mindfulness-based stress reduction to middle school children in the inner city: a review of the literature and approaches." Med Sport Sci **52**: 166-72.

Tai Chi (TC) is the focus of a growing body of literature both qualitative and empirical. Yet there is a paucity of literature on teaching TC to either adolescents or children ages 10-13 presumably because of the level of attention and concentration TC requires. In the pediatric setting, TC appears best combined with other practice activities like mindfulness-based stress reduction (MBSR) that complement the practice of TC, sustain interest and synergistically enhance the benefits TC has been shown to produce in older populations. The literature on the effects of (MBSR) practices with children and teens are also limited. However, the corpus of TC studies suggests significant benefits could be transgenerational if presented in novel ways and taught in developmentally appropriate approaches to children. This chapter explores combining MBSR exercises with TC as one practice that can potentially accomplish this synergy. The chapter includes recommendations for a course design based on two projects created by the author integrating TC and MBSR for ages 11-14 in the inner city of Boston, Mass., USA.

Wang, C. (2008). "Tai Chi improves pain and functional status in adults with rheumatoid arthritis: results of a pilot single-blinded randomized controlled trial." Med Sport Sci **52**: 218-29.

BACKGROUND/AIMS: Rheumatoid arthritis (RA) is a serious health problem resulting in significant morbidity and disability. Tai Chi may be beneficial to patients with RA as a result of effects on muscle strength and 'mind-body' interactions. To obtain preliminary data on the effects of Tai Chi on RA, we conducted a pilot randomized controlled trial. Twenty patients with functional class I or II RA were randomly assigned to Tai Chi or attention control in twice-weekly sessions for 12 weeks. The American College of Rheumatology (ACR) 20 response criterion, functional capacity, health-related quality of life and the depression index were

assessed. RESULTS: At 12 weeks, 5/10 patients (50%) randomized to Tai Chi achieved an ACR 20% response compared with 0/10 (0%) in the control ($p = 0.03$). Tai Chi had greater improvement in the disability index ($p = 0.01$), vitality subscale of the Medical Outcome Study Short Form 36 ($p = 0.01$) and the depression index ($p = 0.003$). Similar trends to improvement were also observed for disease activity, functional capacity and health-related quality of life. No adverse events were observed and no patients withdrew from the study. CONCLUSION: Tai Chi appears safe and may be beneficial for functional class I or II RA. These promising results warrant further investigation into the potential complementary role of Tai Chi for treatment of RA.

Wang, C., C. H. Schmid, et al. (2008). "Tai Chi for treating knee osteoarthritis: designing a long-term follow up randomized controlled trial." BMC Musculoskeletal Disord **9**(1): 108.

ABSTRACT: BACKGROUND: Knee Osteoarthritis (KOA) is a major cause of pain and functional impairment among elders. Currently, there are neither feasible preventive intervention strategies nor effective medical remedies for the management of KOA. Tai Chi, an ancient Chinese mind-body exercise that is reported to enhance muscle function, balance and flexibility, and to reduce pain, depression and anxiety, may safely and effectively be used to treat KOA. However, current evidence is inconclusive. Our study examines the effects of a 12-week Tai Chi program compared with an attention control (wellness education and stretching) on pain, functional capacity, psychosocial variables, joint proprioception and health status in elderly people with KOA. The study will be completed by July 2009. METHODS: Forty eligible patients, age > 55 yr, BMI [less than or equal to] 40 kg/m² with tibiofemoral osteoarthritis (American College of Rheumatology criteria) are identified and randomly allocated to either Tai Chi (10 modified forms from classical Yang style Tai Chi) or attention control (wellness education and stretching). The 60-minute intervention sessions take place twice weekly for 12 weeks. The study is conducted at an urban tertiary medical center in Boston, Massachusetts. The primary outcome measure is the Western Ontario and McMaster Universities (WOMAC) pain subscale at 12 weeks. Secondary outcomes include weekly WOMAC pain, function and stiffness scores, patient and physician global assessments, lower-extremity function, knee proprioception, depression, self-efficacy, social support, health-related quality of life, adherence and occurrence of adverse events after 12, 24 and 48 weeks. DISCUSSION: In this article, we present the challenges of designing a randomized controlled trial with long-term follow up. The challenges encountered in this design are: strategies for recruitment, avoidance of selection bias, the actual practice of Tai Chi, and the maximization of adherence/follow-up while conducting the clinical trial for the evaluation of the effectiveness of Tai Chi on KOA. Trial registration: ClinicalTrials.gov identifier: NCT00362453.

Wang, J. H. (2008). "Effects of Tai Chi exercise on patients with type 2 diabetes." Med Sport Sci **52**: 230-8.

This study investigated the effects of Tai Chi exercise on the levels of blood glucose, insulin and insulin receptors of patients with type 2 diabetes. Twelve subjects aged 58-75 years old (66.5 +/- 8.5 years) with type 2 diabetes participated in the study. They were trained with the protocol of Tai Chi exercise for 8 weeks. Blood glucose, serum insulin, and insulin receptor activity were measured before and after the 8-week intervention and immediately after a single bout exercise of Tai Chi after the protocol. The results showed that by 8 weeks of Tai Chi exercise, the blood glucose decreased ($p < 0.05$), while high- and low-affinity insulin receptor numbers (r_1 , r_2) and low-affinity insulin receptor binding capacity (R_2) increased. Serum insulin increased ($p < 0.05$) but was still within the normal range. After the single bout Tai Chi exercise, blood glucose, high- and low-affinity insulin receptor numbers (r_1 , r_2), and their binding capacity (R_1 , R_2) increased ($p < 0.05$), while serum insulin did not change. The 8-week Tai Chi intervention therefore showed benefits on health status of patients with type 2 diabetes.

Wang, Y. (2008). "Tai Chi exercise and the improvement of mental and physical health among college students." Med Sport Sci **52**: 135-45.

BACKGROUND/AIMS: Physical exercise has positive effects on the body as well as on the mind. The purpose of this study was to examine the effects of Tai Chi exercise on college students' perceptions of their physical and mental health. A 3-month Tai Chi intervention (1 h, twice/week) was administered to 30 college students. The SF-36v2 health survey questionnaire was employed to evaluate the mental health dimension (MHD) and physical health dimension (PHD) before and after the intervention by means of a paired t test ($p < 0.05$). PHD including physical functioning, role physical, bodily pain, general health, and MHD including social functioning, role mental/emotion function, vitality, and perceptions of mental health were assessed. **RESULTS:** Physical measures of bodily pain and general health, and mental measures of role mental/emotion function, vitality, and mental health were significantly improved after Tai Chi intervention. When the overall PHD or MHD scores were evaluated, the MHD increased significantly. **CONCLUSIONS:** Tai Chi exercise had positive effects on the self-assessed physical and mental health of college students. Scores on the MHD appeared to be particularly sensitive to change. Colleges/universities might consider offering Tai Chi as a component of their ongoing physical activity programs available to students.

Wayne, P. M. and T. J. Kaptchuk (2008). "Challenges inherent to t'ai chi research: part II-defining the intervention and optimal study design." J Altern Complement Med **14**(2): 191-7.

Although a growing body of clinical research has begun to evaluate the efficacy and safety of t'ai chi as a therapeutic tool for a variety of health conditions, little attention has been devoted to evaluating "how" t'ai chi is scientifically studied, and the advantages or limitations of different methodological approaches. In a companion to this paper (Part I), we argued that t'ai chi is a complex, multicomponent intervention, which poses unique challenges regarding the distinction of specific versus nonspecific effects and limitations regarding the use of reductionistic research frameworks. In this second, companion paper, we discuss

additional obstacles inherent in precisely defining the t'ai chi intervention in an experimental paradigm. These challenges include t'ai chi's pluralism, the concept of t'ai chi dosage, and long- versus short-term evaluations of t'ai chi's efficacy and safety. To address these challenges, and with a goal to provide complete and unbiased evidence, we propose a pluralistic methodological approach to clinical research that includes controlled randomized trials of fixed protocols, community-based pragmatic trials, cross-sectional studies of long-term practitioners, and studies that integrate qualitative methods.

Wayne, P. M. and T. J. Kaptchuk (2008). "Challenges inherent to t'ai chi research: part I--t'ai chi as a complex multicomponent intervention." J Altern Complement Med **14**(1): 95-102.

In this, the first of 2 companion papers, we present a framework for viewing t'ai chi as a complex, multicomponent intervention that integrates numerous physical, cognitive, and ritualistic components. We discuss how the richness and complexity of t'ai chi poses challenges related to the traditional distinction between specific versus nonspecific effects, the development and interpretation of valid sham controls, and more generally, to the reductionist causal approach of attributing observed outcomes to single, independent component factors. We also discuss parallels between t'ai chi research and the emerging field of whole systems research, and how t'ai chi research may benefit from the use of an ecologic framework. In a second, companion paper, we discuss additional challenges inherent in defining the t'ai chi intervention itself, and more comprehensively outline the benefits and limitations of commonly used clinical research designs to evaluate the efficacy and safety of t'ai chi.

Wayne, P. M., D. P. Kiel, et al. (2007). "The effects of Tai Chi on bone mineral density in postmenopausal women: a systematic review." Arch Phys Med Rehabil **88**(5): 673-80.

OBJECTIVE: To evaluate the evidence for Tai Chi as an intervention to reduce rate of bone loss in postmenopausal women. **DATA SOURCES:** Literature search using Medline, Science Citation Index, Cochrane databases, China Biological Medicine Database, and additional manual reference searches of retrieved articles and personal libraries. **STUDY SELECTION:** Randomized controlled trials (RCTs), prospective cohort studies, and cross-sectional studies that included Tai Chi as an intervention, and had at least 1 outcome related to measurement of bone mineral density (BMD). **DATA EXTRACTION:** Authors critically reviewed studies, evaluated methodologic quality, and synthesized study results in a summary table. **DATA SYNTHESIS:** Six controlled studies were identified by our search. There were 2 RCTs, 2 nonrandomized prospective parallel cohort studies, and 2 cross-sectional studies. The 2 RCTs and 1 of the prospective cohort studies suggested that Tai Chi-naive women who participated in Tai Chi training exhibited reduced rates of postmenopausal declines in BMD. Cross-sectional studies suggested that long-term Tai Chi practitioners had higher BMD than age-matched sedentary controls, and had slower rates of postmenopausal BMD decline. No adverse effects related to Tai Chi were reported in any trial. **CONCLUSIONS:** Conclusions on the impact of Tai Chi on

BMD are limited by the quantity and quality of research to date. This limited evidence suggests Tai Chi may be an effective, safe, and practical intervention for maintaining BMD in postmenopausal women. In combination with research that indicates Tai Chi can positively impact other risk factors associated with low BMD (eg, reduced fall frequency, increased musculoskeletal strength), further methodologically sound research is warranted to better evaluate the impact of Tai Chi practice on BMD and fracture risk in postmenopausal women.

Wong, A. M. and C. Lan (2008). "Tai Chi and balance control." *Med Sport Sci* **52**: 115-23.

Balance function begins to decline from middle age on, and poor balance function increases the risk of fall and injury. Suitable exercise training may improve balance function and prevent accidental falls. The coordination of visual, proprioceptive, vestibular and musculoskeletal system is important to maintain balance. Balance function can be evaluated by functional balance testing and sensory organization testing. Tai Chi Chuan (TC) is a popular conditioning exercise in the Chinese community, and recent studies substantiate that TC is effective in balance function enhancement and falls prevention. In studies utilizing functional balance testing, TC may increase the duration of one-leg standing and the distance of functional reach. In studies utilizing sensory organization testing, TC improves static and dynamic balance, especially in more challenging sensory perturbed condition. Therefore, TC may be prescribed as an alternative exercise program for elderly subjects or balance-impaired patients. Participants can choose to perform a complete set of TC or selected movements according to their needs. In conclusion, TC may improve balance function and is appropriate for implementation in the community.

Woo, J., A. Hong, et al. (2007). "A randomised controlled trial of Tai Chi and resistance exercise on bone health, muscle strength and balance in community-living elderly people." *Age Ageing* **36**(3): 262-8.

BACKGROUND: The beneficial role of exercise in improving bone mineral density, muscle strength and balance, has been documented predominantly in younger populations. These findings may not apply to elderly populations with limited ability to perform exercises of high intensity. **OBJECTIVE:** To examine the effects of Tai Chi (TC) and resistance exercise (RTE) on bone mineral density (BMD), muscle strength, balance and flexibility in community living elderly people. **DESIGN:** Randomised controlled trial, using blocked randomization with stratification by sex. **SETTING:** A community in the New Territories Region of Hong Kong, China. **SUBJECTS:** One hundred eighty subjects (90 men, 90 women) aged 65-74, were recruited through advertisements in community centres. **METHODS:** Subjects were assigned to participate in TC, RTE three times a week, or no intervention (C) for 12 months. Measurements were carried out at baseline, 6 and 12 months. Analyses of covariance (ANCOVA) adjusted for age, and baseline values of variables that were significantly different between groups: i.e. smoking and flexibility for men; quadriceps strength for women. **RESULTS:** Compliance was high (TC 81%, RTE 76%). In women, both TC and RTE groups had less BMD loss at total hip compared with controls. No effect was observed in men. No difference in either balance,

flexibility or the number of falls was observed between either intervention or controls after 12 months. CONCLUSION: The beneficial effects of TC or RTE on musculoskeletal health are modest and may not translate into better clinical outcomes.

Wu, G. (2008). "Age-related differences in Tai Chi gait kinematics and leg muscle electromyography: a pilot study." Arch Phys Med Rehabil **89**(2): 351-7.

OBJECTIVE: To compare the biomechanic features of Tai Chi gait by elders with those by young adults, and with those of normative gait. DESIGN: Cross-sectional study. SETTING: Laboratory-based testing. PARTICIPANTS: Young (n=6; 3 women) and old (n=6; 5 women) Tai Chi practitioners. INTERVENTION: All subjects had practiced Tai Chi for at least 4 months. MAIN OUTCOME MEASURES: Spatial, temporal, and leg muscle electromyography during Tai Chi gait and normative gait. RESULTS: The primary age-related differences in Tai Chi gait were during single stance, with elders having significantly shorter single-stance time (-50%), less lateral displacement (-30%), knee flexion (-42%), hip flexion (-39%), activation time in the tibialis anterior (-13%), soleus (-39%), and tensor fascia lata (TFL) (-21%), activation magnitude in the tibialis anterior (-39%), and coactivation time of the tibialis anterior and soleus (-47%). Compared with normative gait, elders during Tai Chi gait had significantly larger knee (139%) and hip (66%) flexions, longer duration (90%-170%) and higher magnitude (200%-400%) of the tibialis anterior, rectus femoris, and TFL muscle activities, and longer duration of coactivation of most leg muscle pairs (130%-380%). CONCLUSIONS: The elders practice Tai Chi gait in higher posture than younger subjects. The Tai Chi gait poses significantly higher challenges to elder's balance and muscular system than does their normative gait.

Wu, G. (2008). "Muscle action pattern and knee extensor strength of older Tai Chi exercisers." Med Sport Sci **52**: 30-9.

BACKGROUND/AIMS: Tai Chi (TC) practice has been shown to improve leg muscle strength among elders. This study examined the leg muscle action patterns during a typical TC movement, and their relationship with knee extensor strength and knee flexion angle in single leg stance. METHODS: Surface electromyography of four leg muscles and knee movement were recorded from 5 female elderly TC practitioners while performing a TC movement and normal walking, respectively. The maximum knee extensor strength was also measured. The duration and magnitude of electromyography were compared between the TC movement and walking, and were correlated with the knee extensor strength and knee flexion angle. RESULTS: Ankle dorsiflexors and knee extensors were activated significantly longer and higher during the TC movement than during walking. The duration and magnitude of all four leg muscles during the TC movement were positively correlated with the knee extensor strength and knee flexion angle, and these correlations were stronger than during walking. CONCLUSION: The TC movement puts more demand on ankle dorsiflexors and knee extensors that are not otherwise heavily recruited during walking. The degree of knee flexion during single leg

stance of the TC movement may be a key element for improving leg muscle strength.

Wu, G. and D. Millon (2008). "Joint kinetics during Tai Chi gait and normal walking gait in young and elderly Tai Chi Chuan practitioners." Clin Biomech (Bristol, Avon) **23**(6): 787-95.

BACKGROUND: Tai Chi Chuan is becoming a popular exercise among elders. This study measured the inter-segmental forces and moments at the lower extremity joints during a Tai Chi gait as compared to those during normal walking gait, in both apparently healthy young and elderly Tai Chi Chuan practitioners. **METHODS:** Three-dimensional inter-segmental joint reaction force and moment were computed using the Inverse Dynamic Approach based on the kinematics and ground reaction force measurements in a laboratory setting in six young (two females, mean age 28; SD 6 years) and six elderly (five females, mean age 72; SD 8 years) subjects who had previous training of Yang style Tai Chi Chuan. **FINDINGS:** The results showed significant gait differences in both age groups, with significantly smaller peak compressive forces, larger peak shear forces in the ankle, knee and hip joints, and larger peak moments in the knee and hip joints during Tai Chi gait as compared to normal gait. Moreover, the peak shear force was oriented more in the medial-lateral direction at the ankle and knee joints, and the peak moment was in the frontal plane at the knee and hip joints. The results also showed significant age differences, with significantly smaller peak shear forces in all three joints in the elderly group than in the young group during Tai Chi gait. **INTERPRETATION:** Tai Chi gait has an increased shear force and frontal plane torque at lower extremity joints than normal gait. The shear force at all three lower extremity joints during Tai Chi gait is lower in the elderly subjects than young subjects. This data suggest that, in Tai Chi Chuan training, elderly people with degenerative joint diseases in the lower extremity should use caution when practicing Tai Chi Chuan.

Xin, L., Y. D. Miller, et al. (2008). "A preliminary study of the effects of Tai Chi and Qigong medical exercise on indicators of metabolic syndrome and glycaemic control in adults with elevated blood glucose." Br J Sports Med.

OBJECTIVES: To evaluate the feasibility, acceptability and effects of a Tai Chi and Qigong medical exercise program that aimed to improve indicators of metabolic syndrome and glycaemic control in adults with elevated blood glucose. **Design, Setting, and PARTICIPANTS:** A single group pre-post trial of 11 participants (3 male and 8 female; aged 42-65 years) with elevated blood glucose, conducted from August to November 2005 at a university in Australia. **Intervention:** Participants attended Tai Chi and Qigong exercise training for 1 to 1.5 hours, 3 times per week for 12 weeks, and were encouraged to practice the exercises at home. **MAIN OUTCOME MEASURES:** Indicators of metabolic syndrome (body mass index, waist circumference, blood pressure, fasting blood glucose, triglycerides, HDL-cholesterol), and glucose control (HbA1c, fasting insulin and insulin resistance). **RESULTS:** There was good adherence and high acceptability for the group based program. There were significant improvements in four of the seven indicators of metabolic syndrome including body mass index [mean difference -1.05 (95% CI: -

1.48, -0.63), $p < 0.001$], waist circumference [-2.80 cm (-4.97, -0.62), $p < 0.05$], and both systolic [-11.64 mm Hg (-19.46, -3.51), $p < 0.01$] and diastolic blood pressure [-9.73 mm Hg (-13.58, -5.88), $p < 0.001$]. There were also small improvements in HbA1c [-0.32 % (-0.49, -0.15), $p < 0.01$], fasting insulin [-9.93 pmol/L (-19.93, 0.07), $p = 0.051$] and insulin resistance [-0.53 (-0.97, -0.09), $p < 0.05$]. CONCLUSIONS: The program was shown to be feasible and acceptable and the findings suggest that it may be helpful for control of indicators of metabolic syndrome and glycaemic control. Larger controlled studies are needed to confirm these promising results.

Xu, D. Q., Y. Hong, et al. (2008). "Tai Chi exercise and muscle strength and endurance in older people." Med Sport Sci **52**: 20-9.

The purpose of the study was to investigate the influence of regular Tai Chi (TC) practice on muscle strength and endurance of the lower extremities in older people. Twenty-one long-term older TC practitioners were compared with 18 regular older joggers and 22 sedentary counterparts. Maximum concentric strength of knee flexors and extensors was tested at angular velocities of 30 degrees and 120 degrees /s. Ankle dorsiflexors and plantar flexors were tested at 30 degrees /s. Moreover the dynamic endurance of the knee flexors and extensors was assessed at the speed of 180 degrees /s. The strength of knee extensors and flexors in the sedentary group was significantly lower than that in the jogging group and marginally lower than that in the TC group at the higher velocity. For ankle joint, the subjects in both the TC group and the jogging group generated more torque in their ankle dorsiflexors. In addition, the muscle endurance of knee extensors was more pronounced in TC practitioners than the controls. Regular older TC practitioners and joggers showed better scores than the sedentary controls on most of the muscle strength and endurance measures. However, the magnitude of the exercise effects on muscles might depend on the characteristics of different types of exercise.

Yang, Y., J. V. Verkuilen, et al. (2007). "Effect of combined Taiji and Qigong training on balance mechanisms: a randomized controlled trial of older adults." Med Sci Monit **13**(8): CR339-48.

BACKGROUND: Taiji (T'ai Chi) has been shown to have generally positive effects on functional balance. However, few studies have investigated the mechanisms by which Taiji may improve balance. The goal of this study was to evaluate changes in sensory and biomechanical balance mechanisms as a consequence of a traditional Taiji exercise program for healthy older adults that intentionally emphasized both Taiji forms and Qigong meditation. MATERIAL/METHODS: This was a randomized controlled trial with blind testers. Forty-nine healthy older adults (mean age 80.4, SD. 8.6) were randomized to participate in Taiji-Qigong (TQ) training (N=33) or a wait-list control group (WC, N=16). TQ instruction was provided 1 hour/session, 3 sessions a week for six months. Somatosensory, visual, and vestibular ratios of the Sensory Organization Test, and quiet stance Base of Support (BoS) and feet opening angle measures were collected prior to instruction (T0), at two months (T2), and six months (T6). RESULTS: TQ group vestibular ratio scores (normalized

to T0) were +22% and +47% greater than WC at T2 and T6, respectively. The TQ group exhibited an increase in quiet stance BoS over time but not feet opening angle, indicating that the increase in BoS was due to the adoption of wider stances. CONCLUSIONS: Improved use of vestibular input and wider stances are two mechanisms by which Taiji-Qigong training may improve healthy older adults' balance. Further study is needed to evaluate other balance mechanisms and the individual and combined effects of different aspects of traditional Taiji practice.

Yau, M. K. (2008). "Tai Chi exercise and the improvement of health and well-being in older adults." Med Sport Sci **52**: 155-65.

Activity participation has a positive impact on both quantity and quality of life (QOL). Regular participations in physical, social, and cultural activities are associated with successful aging. There is considerable evidence that Tai Chi has positive health benefits; physical, psychosocial and therapeutic. Furthermore, Tai Chi does not only consist of a physical component, but also sociocultural, meditative components that are believed to contribute to overall well-being. This chapter describes the benefits of Tai Chi exercise for the older adults, particularly in terms of the psychosocial aspect. The perceived meanings, associated values and well-being, as well as the impact on QOL, of Tai Chi practice among the older adults in Hong Kong are also discussed. Tai Chi exercise is chosen by the elderly participants for its gentle and soft movements. Besides the physical aspect, the benefits they describe include lifestyle issues, as well as psychological and social benefits. Evidence points out that the improvements in physical and mental health through the practice of Tai Chi among the older adults are related to their perceived level of QOL. Findings from numerous studies support the belief that the practice of Tai Chi has multiple benefits to practitioners that are not only physical in nature. It is recommended as a strategy to promote successful aging.

Yeh, G. Y. (2008). "Commentary on the cochrane review of tai chi for rheumatoid arthritis." Explore (NY) **4**(4): 275-7.

Yeh, G. Y., J. E. Mietus, et al. (2008). "Enhancement of sleep stability with Tai Chi exercise in chronic heart failure: Preliminary findings using an ECG-based spectrogram method." Sleep Med **9**(5): 527-36.

OBJECTIVE: To assess the effects of a 12-week Tai Chi exercise program on sleep using the sleep spectrogram, a method based on a single channel electrocardiogram (ECG)-derived estimation of cardiopulmonary coupling, previously shown to identify stable and unstable sleep states. METHODS: We retrospectively analyzed 24-h continuous ECG data obtained in a clinical trial of Tai Chi exercise in patients with heart failure. Eighteen patients with chronic stable heart failure, left ventricular ejection fraction 40% (mean [+/-standard deviation] age, 59+/-14 years, mean baseline ejection fraction 24%+/-8%, mean) were randomly assigned to receive usual care (N=10), which included pharmacological therapy and dietary and exercise counseling, or 12 weeks of Tai Chi training (N=8) in addition to usual care. Using the ECG-based sleep spectrogram, we compared intervention and control groups by evaluating baseline and 12-week high (stable)

and low (unstable) frequency coupling (HFC & LFC, respectively) as a percentage of estimated total sleep time (ETST). RESULTS: At 12 weeks, those who participated in Tai Chi showed a significant increase in HFC (+0.05+/-0.10 vs. -0.06+/-0.09 % ETST, p=0.04) and significant reduction in LFC (-0.09+/-0.09 vs. +0.13+/-0.13 % ETST, p<0.01), compared to patients in the control group. Correlations were seen between improved sleep stability and better disease-specific quality of life. CONCLUSIONS: Tai Chi exercise may enhance sleep stability in patients with chronic heart failure. This sleep effect may have a beneficial impact on blood pressure, arrhythmogenesis and quality of life.

Yeh, G. Y., C. Wang, et al. (2008). "The effect of tai chi exercise on blood pressure: a systematic review." Prev Cardiol **11**(2): 82-9.

A systematic review of the literature on the effect of tai chi exercise on blood pressure (BP) was performed. The authors searched Medline, CAB, Alt HealthWatch, BIOSIS previews, Science Citation Index, and EMBASE systems (inception through January 2007); researched Chinese Medical, China Hospital Knowledge, China National Knowledge Infrastructure, and China Traditional Chinese Medicine databases (inception to June 2005); and performed hand searches at the medical libraries of Beijing and Nanjing Universities. Clinical studies of tai chi examining BP as an outcome published in English or Chinese were included. Studies reporting only acute exercise effects were excluded. Data were extracted in a standardized manner and 2 independent investigators assessed methodologic quality. Twenty-six studies examining patients with and without cardiovascular conditions met inclusion criteria: 9 randomized controlled trials, 13 nonrandomized studies, and 4 observational studies. Study heterogeneity precluded formal meta-analyses. Twenty-two studies (85%) reported reductions in BP with tai chi (3-32 mm Hg systolic and 2-18 mm Hg diastolic BP reductions). Five randomized controlled trials were of adequate quality (Jadad score > or = 3). No adverse effects were reported. Tai chi exercise may reduce BP and serve as a practical, nonpharmacologic adjunct to conventional hypertension management.

Yeh, S. H., H. Chuang, et al. (2008). "Regular Tai Chi Chuan exercise improves T cell helper function of type 2 DM patients with an increase in T-bet transcription factor and IL-12 production." Br J Sports Med.

BACKGROUND-- Exercise has been shown to be beneficial in treatment of type 2 diabetes mellitus (DM); its benefit to immune function, however, remains to be determined. OBJECTIVE-- This study investigated the effect of a 12-week course of Tai Chi Chuan (TCC) exercise on T cell helper (Th) reaction in type 2 DM patients. DESIGN AND METHODS -- This study was a case-control design. Thirty pairs of type 2 DM patients and normal age-matched adults completed this study. Fasting blood glucose, HbA1c, mediators (IL-12, IL-4 and TGF β) and transcription factors (T-bet, GATA-3 and FoxP3) of Th1/Th2/T regulatory (Treg) reaction were measured before and after a 12-week TCC exercise program. RESULTS -- Fasting glucose and HbA1c levels in the participating type 2 DM patients were significantly higher than age-matched controls before exercise. After the TCC exercise, HbA1c levels in type 2 DM patients significantly decreased (7.59 inverted exclamation markÓ 0.32

vs. 7.16 inverted exclamation markÓ 0.22 %; P= 0.047), along with a significant increase of blood IL-12 levels (5.96 inverted exclamation markÓ 1.10 vs. 12.96 inverted exclamation markÓ 3.07; P = 0.035). To probe molecular Th1/Th2/Treg reaction, we found that type 2 DM patients had lower T-bet, but not GATA-3 or FoxP3 expression than normal controls before TCC exercise. After the 12-week TCC exercise, T-bet expression significantly increased in type 2 DM patients. CONCLUSIONS -- A 12-week TCC exercise program decreases HbA1c levels, along with increase of the Th1 reaction. A combination of TCC with medication may provide even better in both metabolism and immunity of type 2 DM patients.

Yeh, S. H., H. Chuang, et al. (2007). "Tai chi chuan exercise decreases A1C levels along with increase of regulatory T-cells and decrease of cytotoxic T-cell population in type 2 diabetic patients." Diabetes Care **30**(3): 716-8.

Yu, T. Y., Y. C. Pei, et al. (2007). "Comparison of the effects of swimming and Tai Chi Chuan on body fat composition in elderly people." Chang Gung Med J **30**(2): 128-34.

BACKGROUND: Accumulation of fat and substantial loss of muscle mass are common phenomena in the elderly. In this study, we observed the effects of Tai Chi Chuan (TCC) and swimming, two exercises suitable for elderly people, on the percentage body fat and fat distribution by measuring subcutaneous adipose tissue thickness and body composition. METHODS: Subjects were divided into three groups: regular swimmers (n = 20), regular TCC practitioners (n = 32), and age-matched control subjects (n = 31). Subcutaneous adipose tissue thickness was taken using a Lange skinfold caliper at the chests, abdomens, and thighs in the men, and the triceps, suprailium, and thighs in the women. Mid-arm circumference (MAC) was measured on the non-dominant upper arm using fiberglass tape. Body composition was analyzed using the Inbody 3.0 logo, a bioelectrical impedance analysis (BIA) system. RESULTS: No significant differences were found between the three test groups in relation to total body adiposity and arm muscle circumference in the men and women. There was significantly less subcutaneous adipose tissue at the abdomen (p = 0.011) and thigh (p < 0.001) of TCC-group men and at the thighs (p < 0.001) of the swimming group compared with the control group. In women, only the thigh skinfold (p = 0.002) showed a decrease in the TCC group compared with the control group. CONCLUSION: Swimming and TCC may not decrease total fat adiposity in elderly men and women, however, they may change body fat distribution due to certain muscle group usage. The differences observed in the effects of exercise on body fat distribution between elderly women and men may be gender-related.

Zijlstra, G. A., J. C. van Haastregt, et al. (2007). "Interventions to reduce fear of falling in community-living older people: a systematic review." J Am Geriatr Soc **55**(4): 603-15.

The objective was to assess which interventions effectively reduce fear of falling in community-living older people. An extensive search for relevant literature

comprised a database search of PubMed, EMBASE, PsycINFO, and the Cochrane Central Register of Controlled Trials; expert consultation; and manually searching reference lists from potentially relevant papers. Randomized, controlled trials that assessed fear of falling in community-living older people were included. Two independent reviewers extracted data from full papers on study characteristics, methodological quality, outcomes, and process characteristics of the intervention. The search identified 599 abstracts, and 19 papers met the inclusion criteria. Seven of those papers were identified using expert consultation. Fifty-five percent of all validity items and 39% of process characteristic items were fulfilled across the 19 trials. Twelve of the 19 papers were of higher methodological quality. In 11 of these trials, fear of falling was lower in the intervention group than in the control group. Interventions that showed effectiveness were fall-related multifactorial programs (n=5), tai chi interventions (n=3), exercise interventions (n=2), and a hip protector intervention (n=1). Three of these interventions explicitly aimed to reduce fear of falling. Several interventions, including interventions not explicitly aimed at fear of falling, resulted in a reduction of fear of falling in community-living older people. Limited but fairly consistent findings in trials of higher methodological quality showed that home-based exercise and fall-related multifactorial programs and community-based tai chi delivered in group format have been effective in reducing fear of falling in community-living older people.