

# A Comprehensive Review of Health Benefits of Qigong and Tai Chi

Jahnke R, Larkey L, Rogers C and Etnier J

## ABSTRACT

Research examining psychological and physiological benefits of Qigong and Tai Chi is growing rapidly. The many practices described as Qigong or Tai Chi have similar theoretical roots, proposed mechanisms of action and expected benefits. Research trials and reviews, however, treat them as separate targets of examination. This review examines the evidence for achieving outcomes from randomized controlled trials (RCTs) of both.

# A Comprehensive Review of Health Benefits of Qigong and Tai Chi

## Abstract

**Objective:** Research examining psychological and physiological benefits of Qigong and Tai Chi is growing rapidly. The many practices described as Qigong or Tai Chi have similar theoretical roots, proposed mechanisms of action and expected benefits. Research trials and reviews, however, treat them as separate targets of examination. This review examines the evidence for achieving outcomes from randomized controlled trials (RCTs) of both.

**Data Sources:** The key words tai chi, taiji, and qigong were entered into electronic search engines for the Cumulative Index for Allied Health and Nursing (CINAHL), Psychological Literature (PsychInfo), PubMed, Cochrane database, and Google Scholar.

**Study Inclusion Criteria:** RCTs reporting on the results of Qigong or Tai Chi interventions and published in peer reviewed journals published from 1993-2007

**Data Extraction:** Country, type and duration of activity, number/type of subjects, control conditions, and reported outcomes were recorded for each study.

**Synthesis.** Outcomes related to Qigong and Tai Chi practice were identified and evaluated.

**Results.** Seventy-seven articles met the inclusion criteria. The 9 outcome category groupings that emerged were: bone density (n=4), cardiopulmonary effects (n=19), physical function (n=16), falls and related risk factors (n=23), Quality of Life (n=17), self-efficacy (n=8), patient reported outcomes (n=13), psychological symptoms (n=27), and immune function (n=6).

**Conclusions:** Research has demonstrated consistent, significant results for a number of health benefits in RCTs, evidencing progress toward recognizing the similarity and equivalence of Qigong and Tai Chi.

**Key Words:** tai chi; taiji; meditation; qigong; mind body practice; meditative movement; moderate exercise; breathing.

**Indexing Key Words:** Format: Literature Review

## **A Comprehensive Review of Health Benefits of Qigong and Tai Chi**

A substantial body of published research has examined the health benefits of Tai Chi (*also called Taiji*) a traditional Chinese wellness practice. In addition, a strong body of research is also *emerging for Qigong, an even more ancient traditional Chinese wellness practice that has similar characteristics to Tai Chi*. Qigong and Tai Chi have been proposed, along with Yoga and Pranayama from India, to constitute a unique category or type of exercise referred to currently as meditative movement (Larkey, Jahnke, Etnier, & Gonzalez, 2009). These two forms of meditative movement, Qigong and Tai Chi, are close relatives having shared theoretical roots, *common operational components*, and similar links to the wellness and health promoting aspects of traditional Chinese medicine. They are nearly identical in practical application in the health enhancement context and share much overlap in *what traditional Chinese medicine describes as the “three regulations”*: *body focus (posture and movement), breath focus, and mind focus (meditative components)* (Jahnke, 2002; Larkey et al., 2009).

Due to the similarity of Qigong and Tai Chi, this review of the state of the science for these forms of meditative movement will investigate the benefits of both forms together. In presenting evidence for a variety of health benefits, many of which are attributable to both practices, we will point to the magnitude of the combined literature and suggest *under what circumstances Qigong and Tai Chi may be considered as potentially equivalent interventions, with recommendations for standards and further research to clarify this potential*.

### **Objectives**

Previously published reviews have reported on specific outcomes of either Tai Chi or Qigong, mostly addressing only one of these practices, and rarely taking into account the

similarity of the two forms and their similar outcomes. These reviews have covered a wide variety of outcomes, with many focused on specific diseases or symptoms including: hypertension (M. S. Lee, Pittler, Guo, & Ernst, 2007); cardiovascular disease (Cheng, 2006; M. S. Lee, Pittler, Taylor-Piliae, & Ernst, 2007); cancer (M. S. Lee, Chen, Sancier, & Ernst, 2007; M. S. Lee, Pittler, & Ernst, 2007; Mansky et al., 2006); arthritic disease (M. S. Lee, Pittler, & Ernst, 2007); stroke rehabilitation (Taylor-Piliae & Haskell, 2007); aerobic capacity (Taylor-Piliae & Froelicher, 2004); falls and balance (Verhagen, Immink, van der Meulen, & Bierma-Zeinstra, 2004; Wayne et al., 2004); bone mineral density (Wayne et al., 2007); and shingles-related immunity (M. Irwin, Pike, & Oxman, 2004), with varying degrees of support noted for outcomes in response to Qigong or Tai Chi.

Other reviews have addressed a broad spectrum of outcomes to demonstrate how Qigong (C. Lan, Lai, & Chen, 2002; Sancier & Hu, 1991; Sancier, 1996; Sancier, 1999) or Tai Chi (Adler & Roberts, 2006; Hogan, 2005; Kemp, 2004; J. X. Li, Hong, & Chan, 2001; Matsuda, Martin, & Yu, 2005; C. Wang, Collet, & Lau, 2004; S. L. Wolf, Coogler, & Xu, 1997) have demonstrated improvements for participants with a variety of chronic health problems or with vulnerable older adults. While many of these reviews have utilized selection criteria which restrict their focus to rigorous empirical studies, others have used less stringent criteria. *The purpose of this review is to evaluate the current evidence for a broad range of health benefits for both Qigong and Tai Chi using only randomized controlled trials (RCTs), and to evaluate this evidence to consider the potential of treating these two forms of meditative movement as equivalent forms. A complete description of Qigong and Tai Chi is presented and the equivalence of their theoretical roots and their common elements of practice are established. Then, the body of evidence for outcomes in response to Qigong and Tai Chi is reviewed to*

*examine the range of health benefits. Finally, to more critically evaluate similarities across studies of the two practices we discuss the potential of treating them as equivalent interventions in research and the interpretation of results across studies.*

**Research Question 1:** What health benefits are evidenced from RCTs of Qigong and Tai Chi?

**Research Question 2:** In examining the Qigong and Tai Chi practices incorporated in research, and the evidence for health benefits commensurate with each, what claims can be made for equivalence of these two forms of practice/exercise that have typically been considered to be separate and different?

### Overview of Qigong and Tai Chi

Qigong is, definitively, more ancient in origin than Tai Chi and it is the over-arching, more original discipline incorporating widely diverse practices designed to cultivate functional integrity and the enhancement of the life essence that the Chinese call Qi. Both Qigong and Tai Chi sessions incorporate a wide range of physical movements, including slow, meditative, flowing, dance-like motions. In addition, they both can include sitting or standing meditation postures as well as either gentle or vigorous body shaking. Most importantly, both incorporate *the purposeful regulation of both breath and mind coordinated with the regulation of the body.* Qigong and Tai Chi are both based on theoretical principles that are inherent to traditional Chinese medicine (TCM) (Larkey et al., 2009). In the ancient teachings of health-oriented Qigong and Tai Chi, the instructions for attaining the state of enhanced Qi capacity and function point to the purposeful coordination of body, breath and mind (paraphrased here): “Mind the body and the breath, and then clear the mind to distill the Heavenly elixir within”. This combination of self-awareness with self-correction of the posture and movement of the body, the flow of breath, and stilling of the mind, are thought to comprise a state which activates the

natural self-regulatory (self-healing) capacity, stimulating the balanced release of endogenous neurohormones and a wide array of natural health recovery mechanisms which are evoked by the intentful integration of body and mind.

Despite variations among the myriad forms, we assert that health oriented Tai Chi and Qigong emphasize the same principles and practice elements. Given these similar foundations and the fashion in which Tai Chi has typically been modified for implementation in clinical research, we suggest that the research literature for these two forms of meditative movement should be considered as one body of evidence.

### *Qigong*

*Qigong translates from Chinese to mean, roughly, to cultivate or enhance the inherent functional (energetic) essence of the human being. It is considered to be the contemporary offspring of some of the most ancient (before recorded history) healing and medical practices of Asia. Earliest forms of Qigong make up one of the historic roots of contemporary Traditional Chinese Medicine (TCM) theory and practice (Jahnke, 2002). Many branches of Qigong have a health and medical focus and have been refined for well over 5000 years. Qigong purportedly allows individuals to cultivate the natural force or energy (“Qi”) in TCM that is associated with physiological and psychological functionality. Qi is the conceptual foundation of TCM in acupuncture, herbal medicine and Chinese physical therapy. It is considered to be a ubiquitous resource of nature that sustains human well-being and assists in healing disease as well as (according to TCM theory) having fundamental influence on all life and even the orderly function of celestial mechanics and the laws of physics. Qigong exercises consist of a series of orchestrated practices including body posture/movement, breath practice, and meditation, all designed to enhance Qi function (that is, drawing upon natural forces to optimize and balance*

energy within) through the attainment of deeply focused and relaxed states. From the perspective of Western thought and science, Qigong practices activate naturally occurring physiological and psychological mechanisms of self-repair and health recovery.

Also considered part of *the overall domain of Qigong* is “external Qigong” wherein a trained medical Qigong therapist diagnoses patients according to the principles of TCM and uses “emitted Qi” to foster healing. Both internal Qigong (personal practice) and external Qigong (clinician emitted Qi) are seen as affecting the balance and flow of energy and enhancing functionality in the body and the mind. For the purposes of our review, we are focused only on the individual, internal Qigong practice of exercises performed with the intent of cultivating enhanced function, inner Qi that is ample and unrestrained. This is the *aspect of Qigong that parallels what is typically investigated in Tai Chi research*.

There are thousands of forms of Qigong practice that have developed in different regions of China during various historic periods and that have been created by many specific teachers and schools. Some of these forms were designed for general health enhancement purposes and some for specific TCM diagnostic categories. Some *were originally developed as rituals for spiritual practice, and others to empower greater skill in the martial arts*. An overview of the research literature pertaining to internal Qigong yields more than a dozen forms that have been studied as they relate to health outcomes (e.g., Guo-lin, ChunDoSunBup, Vitality or Bu Zheng Qigong, Eight Brocade, Medical Qigong) (K. Chen & Yeung, 2002; Cheung et al., 2005; Jahnke, 2002; M. S. Lee et al., 2003).

*The internal Qigong practices generally tested in health research (and that are addressed in this review), incorporate a range of simple movements (repeated and often flowing in nature), or postures (standing or sitting) and include a focused state of relaxed awareness and a variety*

*of breathing techniques that accompany the movements or postures. A key underlying philosophy of the practice is that any form of Qigong has an effect on the cultivation of balance and harmony of Qi, positively influencing the human energy complex (Qi channels/pathways) which functions as a holistic, coherent and mutually interactive system.*

### *Tai Chi*

Tai Chi translates to mean, “Grand Ultimate”, and in the Chinese culture, it represents an *expansive philosophical and theoretical notion which describes the natural world (i.e., the universe) in the spontaneous state of dynamic balance between mutually interactive phenomena including the balance of light and dark, movement and stillness, waves and particles. Tai Chi, the exercise, is named after this concept and was originally developed both as a martial art (Tai Chi Chuan or taijiquan) and as a form of meditative movement. The practice of Tai Chi as meditative movement is expected to elicit functional balance internally for healing, stress neutralization, longevity, and personal tranquility. This form of Tai Chi is the focus of this review.*

For numerous, complex sociological and political reasons (Jahnke, 2002), Tai Chi has become one of the best known forms of exercise or practice for refining Qi and is purported to enhance physiological and psychological function. *The one factor that appears to differentiate Tai Chi from Qigong is that traditional Tai Chi is typically performed as a highly choreographed, lengthy, and complex series of movements, while health enhancement Qigong is typically a simpler, easy to learn, more repetitive practice. However, even the longer forms of Tai Chi incorporate many movements that are similar to Qigong exercises. Usually, the more complex Tai Chi routines include Qigong exercises as a warm-up, and emphasize the same basic principles for practice, that is, the three regulations of body focus, breath focus and mind focus.*

*Therefore Qigong and Tai Chi, in the health promotion and wellness context, are operationally equivalent.*

#### *Tai Chi as Defined in the Research Literature*

*It is especially important to note that many of the RCTs investigating what is described as Tai Chi (for health enhancement), are actually not the traditional, lengthy, complex practices that match the formal definition of traditional Tai Chi. The Tai Chi used in research of both disease prevention and as a complement to medical intervention is often a “modified” Tai Chi (e.g., Tai Chi Easy, Tai Chi Chih, or “short forms” that greatly reduce the number of movements to be learned). The modifications generally simplify the practice, making the movements more like most health oriented Qigong exercises that are simple and repetitive, rather than a lengthy choreographed series of Tai Chi movements that take much longer to learn (and, for many participants, reportedly delay the experience of “settling” into the relaxation response). A partial list of examples of modified Tai Chi forms from the RCTs in the review are: balance exercises inspired by Tai Chi (Faber, 2006), Tai Chi for arthritis, 5 movements from Sun Tai Chi (Fransen, 2007), Tai Chi Six Form (Greenspan, 2007), Yang Eight Form Easy (Li, 2003), and Yang Five Core Movements (Yeh, 2004).*

*In 2003, a panel of Qigong and Tai Chi experts was convened by the University of Illinois and the Blueprint for Physical Activity to explore this very point (Chodzko-Zajko, Jahnke, 2005 -- [http://healerwithinfoundation.org/National\\_Expert\\_Meeting/](http://healerwithinfoundation.org/National_Expert_Meeting/)). The expert panel agreed that it is appropriate to modify (simplify) Tai Chi to more efficiently disseminate the benefits to populations in need of cost effective, safe and gentle methods of physical activity and stress reduction. These simplified forms of Tai Chi are very similar to the forms of Qigong used in health research.*

For this reason, it is not only reasonable, but a critical contribution to the emerging research dialogue to review the RCTs that explore the health benefits resulting from both of these practices together, as one comprehensive evidence base for the meditative movement practices originating from China.

## **Methods**

### *Data Sources*

The following data bases were used to conduct literature searches for potentially relevant articles: Cumulative Index for Allied Health and Nursing (CINAHL), Psychological Literature (PsychInfo), PubMed, Google Scholar, and the Cochrane database. The key words included Tai Chi, Taiji, Tai Chi Chuan, and Qigong combined with RCT or with clinical research terms. Additional hand searches (based on word-of-mouth recommendations) completed the search for articles.

### *Study Inclusion Criteria.*

Criteria for inclusion of articles included that they: a) were published in a peer-reviewed English-language journal between 1993 and December, 2007; b) were cited in nursing, medical, or psychological literature; c) were designed to test the effects of Tai Chi or Qigong; and d) used a RCT research design. The literature search resulted in the identification of 576 articles to be considered for inclusion. The full texts of 158 articles appearing to meet initial criteria (a-d) were retrieved for further evaluation and to verify which ones were, in fact, RCTs, resulting in a final set of 77 articles meeting all of our inclusion criteria

### *Data Abstraction*

Articles were read and results were entered into a table according to criteria established by the authors for categorization and evaluation of the studies and outcomes. Included in Table One for review and discussion are: country of study; type and number of patients randomized; duration and type of intervention and control condition; measured outcomes; and results. As the information was entered into the table it became apparent that some of the authors reported results from the same study in more than one article. Thus, the 77 articles selected actually represented 67 unique studies, with 1 study reporting a range of outcomes across 4 articles, and 5 other studies' results published in 2 articles each. An additional two articles were not entered into the table (F. Li, Harmer, Fisher, & McAuley, 2004; Orr, Tsang, Lam, Comino, & Singh, 2006) as the same results were reported in newer articles. Other than these two dropped articles, multiple articles are entered into the table as representing one study (see Table One) so that the full range of outcomes reported across the articles can be reported without inflating the number of studies.

### *Synthesis*

Three authors independently reviewed the articles selected for inclusion and considered categorizing studies by type of patient or disease outcome. Many of the studies drew participants from a general, healthy population (n=16), so a category schema based on patient type or disease would not have included all of the studies. The authors revisited the long list of health benefits and outcomes assessed across the studies and generated broad categories that combined related health outcomes into larger groups. These initial categories were defined based on identifying the most frequently measured primary outcomes, and then refining the groups to develop an investigation framework that accommodated all of the research outcomes into at least one of the categories. These categories of outcomes related to Qigong and Tai Chi practice were discussed

and continually reworked until we had clear, non-overlapping boundaries for each category based on similar symptoms or health indicators related to a common function or common target organ system. These groupings are not intended to be conclusive taxonomies but rather are used for this review as convenient and meaningful tools for evaluating similar groups of outcomes. In this way, examining health outcomes across a variety of study designs and populations (including, healthy, diseased or at-risk patients) was possible.

## **Results**

### *Study Description*

A total of 6410 participants were included across these reported studies. While some of the studies compared Qigong or Tai Chi to other forms of exercise (n=13), many compared to a non-exercise treatment control group such as education or usual care (n=43) and some used both exercise and non-exercise comparison groups to evaluate effects of Qigong or Tai Chi interventions (n=11). Most studies included healthy adults (n=16 studies), but several studies included participants based on specific risk factors or diagnosis of disease including: arthritis (n=5); heart disease (n=6); hypertension (n=5); osteoporosis risk [e.g., peri-menopausal (n=3)]; fall risk determined by age and sedentary lifestyle or poor physical function and balance (n=18); breast cancer (n=1); depression (n=2); fibromyalgia (n=2); immune dysfunction including HIV/AIDS and varicella history or vaccine response (n=3); muscular dystrophy (n=1); Parkinson's disease (n=1); neck pain (n=1); sleep complaints (n=1); chronic disease (n=1); and traumatic brain injury (n=1). Some of the studies (n=9) monitored adverse effects during the interventions and none reported an adverse event.

The studies originated from 13 countries (USA, n=34; China (including Hong Kong), n=9; Korea, n=4; Australia and New Zealand, n=5; Sweden, n=4; Great Britain, n=3; Italy and Taiwan, each n=2; Netherlands, Israel, Poland, and Spain, each n=1).

### *Outcomes*

From all of the studies, 163 different physiological and psychological health outcomes were identified. Many of the studies assessed outcomes across more than one category (e.g., physical function as well as a variety of psychosocial and fitness outcomes), so some studies are discussed in more than one section in the review of categories that follows.

The 9 outcome category groupings that emerged are: bone density (n=4), cardiopulmonary effects (n=19), physical function (n=16), falls, balance and related risk factors (n=23), quality of life (n=17), self-efficacy (n=8), patient reported outcomes (n=13), psychological symptoms (n=27), and immune- and inflammation-related responses (n=6). Within each category of outcomes, there were both Qigong and Tai Chi interventions represented.

### *Bone Density*

Resistance training and other weight bearing exercises are known to increase bone formation (American College of Sports Medicine, 2004) and have been recommended for post-menopausal women for that purpose (Maddalozzo & Snow, 2000). Interestingly, most Qigong and Tai Chi practices involve no resistance and only minimal weight bearing (such as gentle knee bends), yet the four RCTs (total sample size=427) included in this review reported positive effects on bone health. One study examined the effect of Qigong (H. H. Chen, Yeh, & Lee, 2006) and three examined Tai Chi (Chan et al., 2004; Shen et al., 2007; Woo, Hong, Lau, & Lynn, 2007). Bone loss was retarded and numbers of fractures were less among post-menopausal women practicing Tai Chi compared to usual care Chan et al, 2004}}, (Chan et al., 2004). In

another study, bone loss was less pronounced for post-menopausal females practicing Tai Chi or resistance training compared to no-exercise controls, but this effect was not found in the older men participating in the study (Woo et al., 2007). Shen and colleagues (Shen et al., 2007) compared Tai Chi to resistance training and reported significant changes in biomarkers of bone health in both groups. Bone mineral density increased for women following Qigong exercises as compared to no-exercise controls (H. H. Chen et al., 2006). In summary, current research suggests a favorable effect on bone health for those practicing Tai Chi or Qigong.

### *Cardiopulmonary*

Nineteen studies [Qigong (n=7) and Tai Chi (n=12)] reported favorable cardiovascular and/or pulmonary outcomes. Participants in this grouping of studies were generally older adults (mean age=61.02) and inclusion criteria varied from history of disease to reported sedentary behavior. Measures of cardiopulmonary function were representative of cardiopulmonary fitness and cardiovascular disease risk and included blood pressure, heart rate, ejection fraction rates, blood lipids, 6-minute walk distance, ventilatory function, and body mass index (BMI).

One of the most consistent findings was the significant reduction in blood pressure reported in multiple studies, especially when Qigong (M. S. Lee, Lee, Choi, & Chung, 2003; M. S. Lee, Lee, Kim, & Choi, 2004) or Tai Chi (Tsai et al., 2003; S. L. Wolf et al., 2006) were compared to inactive control groups such as usual care, educational classes, or wait-list controls. Even when compared to active control groups such as aerobic exercise or balance training, Tai Chi showed a significant reduction in blood pressure in two studies (S. L. Wolf et al., 2003b; Young, Appel, Jee, & Miller, 1999). Other studies, however, that utilized active control interventions (low to moderate levels of physical activity) expected to reduce blood pressure showed positive changes for both groups, but without significant differences between Qigong

(Cheung et al., 2005) or Tai Chi (Channer, Barrow, Barrow, Osborne, & Ives, 1996; Motivala, Sollers, Thayer, & Irwin, 2006) and the comparison group; thus, providing preliminary evidence that these meditative movement practices achieve similar results to conventional exercise.

Other indicators of cardiac health have been evaluated. Reduced heart rate is reported (Channer et al., 1996;; S. L. Wolf et al., 2003b) as well as increases in heart rate variability (Audette et al., 2006). These reported changes in blood pressure, heart rate, and heart rate variability suggest that one or several of the key components of Tai Chi and Qigong, that is body, breath, and mind, may affect sympathetic and parasympathetic balance and activity.

Biomarkers of heart-health have been shown to improve in response to Qigong or Tai Chi practice. Yeh and colleagues. (Yeh et al., 2004) reported significantly improved Serum B-type natriuretic peptide levels in response to Tai Chi compared to usual care controls, indicating improved left ventricular function. Lipid profiles improved in two studies (M. S. Lee et al., 2004; Tsai et al., 2003) comparing Qigong and Tai Chi to inactive controls while another study of Qigong (Pippa et al., 2007) reported no change in cholesterol levels compared to inactive (wait-list) controls. Pippa and colleagues also reported no change in ejection fraction rates following a 16-week study of Qigong among participants with a history of chronic atrial fibrillation. Urine catecholamine levels were significantly decreased in participants practicing Tai Chi compared to wait-list controls (M. S. Lee et al., 2003) but a similar trend did not reach significance in another study with only 15 participants per treatment condition (Yeh et al., 2004).

A variety of cardiopulmonary fitness indicators have been examined for both Qigong and Tai Chi. Participants with a history of heart failure reported significant improvements in the incremental shuttle walk following a combined Tai Chi/Qigong intervention implemented in two studies incorporating inactive control groups (Barrow, Bedford, Ives, O'Toole, & Channer, 2007;

Yeh et al., 2004). Women treated for breast cancer achieved significantly increased distances in the 6-minute walk test in response to Tai Chi compared to a psychosocial support control intervention (Mustian, Katula, & Zhao, 2006) and  $VO_{2\text{ max}}$  increased significantly more following a Tai Chi intervention compared to resistance training and usual care control groups. {{433 Audette, Joseph F. 2006}} In contrast to these consistent findings for cardiopulmonary benefits, one study found no significant improvement in response to Qigong, while aerobic training did achieve significant changes. In this small (n=11 in each arm of study) cross-over study of patients with Parkinson's disease, participants practiced Qigong or aerobic training in random order for 7 weeks (with 8 weeks rest in between intervention periods), results on the 6-minute walk test,  $VO_{2\text{ peak}}$  and  $VO_{2/\text{Kg}}$  ratio were significantly improved for those who completed the aerobic exercise protocol, but no significant effects were found for those practicing Qigong (Burini et al., 2006).

Most of the non-significant findings have been found in studies with participants with some form of chronic illness or recovery from cancer at study entry. For example, respiratory function improved clinically, but not significantly, for patients with chronic heart failure practicing Tai Chi compared to usual care (Yeh et al., 2004), and as described above, was relatively unchanged for the Qigong group with a history of Parkinson's disease compared to an aerobic training control group (Burini et al., 2006). A group of patients with muscular dystrophy (Wenneberg, Gunnarsson, & Ahlstrom, 2004) showed a trend for improvement that did not reach significance compared to a wait-list control. Further, no change in cardiovascular function was reported for sedentary participants with a history of osteoarthritis (Song, Lee, Lam, & Bae, 2003). Aerobic capacity was shown to improve with Tai Chi, though not significantly more so than with inactive controls in a small study of breast cancer survivors (Mustian et al., 2006). It is

important to point out that of these five studies that failed to demonstrate significant improvements following Qigong or Tai Chi, four had 31 or fewer participants. It is difficult to discern if non-significant findings in cardiopulmonary fitness are due to some pattern of ineffectiveness with chronic and debilitating illness or if they are a result of the limited statistical power.

One of the key risk factors for cardiac disease is obesity. Qigong has demonstrated a greater reduction in BMI as compared to an exercise control group in two studies (Cheung et al., 2005; S. L. Wolf et al., 2006), but this difference was not significant. Another study demonstrated a marked but non-significant reduction in waist circumference with Tai Chi compared to usual care for older adults (Thomas et al., 2005). Conversely, one study using Qigong and two with Tai Chi (respectively) (Pippa et al., 2007; Song et al., 2003; Young et al., 1999) reported no change in BMI compared to usual care and another implementing a Qigong intervention (Elder et al., 2007) failed to maintain weight loss, suggesting the data are inconclusive at this point as to whether or not these practices may consistently affect weight.

A few studies of both Qigong and Tai Chi have examined level of intensity, indicating that some forms of these practices fall within the moderate intensity level, (C. Lan, Chou, Chen, Lai, & Wong, 2004; Taylor-Piliae & Froelicher, 2004), but for the most part, level of exercise intensity is not reported. Cardiopulmonary benefits of Qigong and Tai Chi may partially be explained as a response to aerobic exercise, but with the wide range of speeds with which these exercises are executed, it would be important to assess this factor for a better understanding of the elements that contribute to outcomes. Regardless of the mechanisms, the preponderance of studies on cardiopulmonary outcomes show that Qigong and Tai Chi are effective compared to

inactive controls, or at least approximately equal to the expected benefits of conventional exercise.

### *Physical Function*

Decreased physical activity is related to declining physical function in all populations and that decline is compounded by the natural process of aging (Freemont & Hoyland, 2007; Spirduso, Francis, & MacRae, 2005). Changes in physical function were assessed in 16 studies (Qigong, n=2; Tai Chi, n=14). Most of the studies were conducted with older adults (i.e., studies in which mean age = 55 years or older, n=13) and several recruited specifically for participants with chronic pain (e.g., osteoarthritis, neck pain, or fibromyalgia, n = 5). A number of behavioral measures of physical function performance were included in this category of outcomes which also includes self-reported responses on scales representing physical function. Although fitness outcomes, such as the 6-minute walk test, might also be seen as assessing overall physical function, we did not include tests already discussed in the cardiopulmonary fitness category, but rather focused on functional tests that are usually used to assess capacity for daily living. Studies that assessed changes in overall physical activity levels are also included as an outcome pertaining to physical function.

Physical function measured with a wide variety of performance indicators, including chair rise, 50-ft walk, gait speed, muscle contraction strength, hand grip, flexibility, and function as measured on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC, an osteoarthritis-specific assessment for function, stiffness, and pain), were variously found to be significantly improved in 5 studies comparing Tai Chi to minimal activity (usual or stretching activity, psychosocial support, or education) comparison groups (672 Faber, Marjan J. 2006; 663 Fransen, Marlene 2007; 743 Galantino, Mary Lou 2005; 674 Gatts, Strawberry K. 2006; 675

Mustian, Karen M. 2006}} and one study of Tai Chi compared to an exercise therapy control intervention {{746 Lansinger, Birgitta 2007}}. One of these studies combined functional walking with Tai Chi to achieve significant improvements with pre-frail elders compared to usual care (Faber, Bosscher, Chin A Paw, & van Wieringen, 2006).

In contrast, in 7 studies including participants with osteoarthritis or multiple comorbidities, some of the physical function measures were not significantly different for Tai Chi or Qigong in comparison to inactive controls. This was the case for gait speed (S. L. Wolf et al., 2006), timed up and go, 50-ft. walk and stair climb (Fransen, Nairn, Winstanley, Lam, & Edmonds, 2007) and 50-ft. walk and chair stand (Hartman et al., 2000; F. Li, Harmer, McAuley, Fisher et al., 2001). In one study of 30 patients with osteoarthritis practicing Tai Chi twice per week (Hartman et al., 2000) and another with 36 participants with fibromyalgia that utilized hand grip and chair stand to test a 20 minutes per week Qigong intervention (Mannerkorpi, Arndorw, Mannerkorpi, & Arndorw, 2004), neither achieved significant improvements compared to usual care. In one exception to this trend, one measure of functional performance, time to complete chair rise, was significantly improved in transitionally frail elders in the Tai Chi group compared to a wellness education control group (S. L. Wolf et al., 2006),.

Studies using self-report measures consistently show positive results for Tai Chi. Self-reported improvement in physical function for sedentary older adults was demonstrated for Tai Chi compared to wait-list controls (F. Li, Harmer, McAuley, Duncan et al., 2001; F. Li, Harmer, McAuley, Fisher et al., 2001), and a stretching exercise control (F. Li, Fisher, Harmer, & Shirai, 2003).

Results in this category of outcomes are inconsistent, with a preponderance of studies recruiting sedentary, or chronically ill or frail elder participants. Even so, a handful of these

studies successfully demonstrated potential for Qigong and Tai Chi to build performance, even with health compromised individuals. Further studies are needed to examine the factors that are important to more critically evaluate these interventions (such as power considerations or dose and frequency of the interventions), or learn if there are particular states of ill health that are less likely to respond to this form of exercise.

### *Falls and Balance*

Another large grouping of studies focused primarily on falls prevention, balance, and physical function tests related to falls and balance (such as one-leg stance). Although there may be some crossover of implied benefits to the more general physical function measures reported above, this separate category was established to report on the studies of interventions primarily targeting falls and related measures. Fear of falling is reported with the psychological outcomes and fall self-efficacy is reported in the self-efficacy outcomes rather than in this category of falls and balance.

Outcomes related to falls such as balance, fall rates, and improved strength and flexibility were reported in 24 articles (Qigong, n=2, Tai Chi, n=20, and 2 studies that included both practices). Scores directly assessing balance (such as one-leg stance) or other closely related measures were consistently, significantly improved in 16 Tai Chi studies that only included participants who were sedentary or deemed at risk for falls at baseline (Audette et al., 2006; Choi, Moon, & Song, 2005; Gatts & Woollacott, 2006; F. Li et al., 2003; F. Li et al., 2005; Maciaszek, Osiski, Szeklicki, & Stemplewski, 2007; Sattin, Easley, Wolf, Chen, & Kutner, 2005; Song et al., 2003; T. Tsang, Orr, Lam, Comino, & Singh, 2007; Voukelatos, Cumming, Lord, & Rissel, 2007; C. Wang et al., 2005; S. L. Wolf, Barnhart, Ellison, & Coogler, 1997; S. L.

Wolf et al., 2003a; S. L. Wolf et al., 2003b; Woo et al., 2007; J. Zhang, IshikawaTakata, Yamazaki, Morita, & Ohta, 2006).

Qigong has been less studied in relationship to balance-related outcomes; however, results suggest that there was a trend to maintain balance using Qigong in a population of patients with muscular dystrophy (Wenneberg et al., 2004). In two studies that used both Qigong and Tai Chi, several measures of balance were significantly improved with sedentary women (Stenlund, Lindstrom, Granlund, & Burell, 2005) and with elderly healthy adults (mean age 80.4 years) compared to wait list controls {{657 Yang, Yang 2007}}.

Another set of studies shows the effect of Tai Chi on balance to be similar to conventional exercise or physical therapy control interventions aimed at improving physical function related to balance (Audette et al., 2006; Nowalk, Prendergast, Bayles, D'Amico, & Colvin, 2001; T. Tsang et al., 2007); or vestibular rehabilitation (McGibbon et al., 2004; McGibbon et al., 2005). On the other hand, in a study of stroke survivors comparing Tai Chi to balance exercises, significant improvements in balance were achieved in the exercise control group, but not for Tai Chi (Hart et al., 2004). While knee extension was significantly improved, balance was not improved significantly in a Tai Chi intervention with sedentary women compared to a flexibility training control group {{745 Judge, J.O. 1993}}.

Mechanisms of gait performance which are important to understanding how Tai Chi affects balance were also studied. Reported improvements were found in 4 studies (Hass et al., 2004; McGibbon et al., 2004; McGibbon et al., 2005; S. L. Wolf et al., 1997). Strength and flexibility are also important to fall prevention. Four studies found significant improvements in these factors when Tai Chi was compared to an active control (brisk walking) (Audette et al.,

2006); or inactive controls {{317 Choi,Jung Hyun 2005; 688 Song,Rhayun 2003; 226 Zhang,J. 2006}}.

Eight studies directly monitored fall rates. Studies that incorporate educational or less active control interventions (e.g., stretching), variously demonstrated significant falls reduction for Tai Chi {{251 Wolf,S.L. 2003; 229 Li,F. 2005; 672 Faber,Marjan J. 2006; 656 Voukelatos,Alexander 2007}} or non-significant reductions compared to control {{660 Woo,Jean 2007; 271 Wolf,Steven L. 2003}}. In a study comparing Tai Chi to an active physical therapy intervention designed to improve balance, results were similar (non-significant differences) between the two groups {{753 Nowalk,M.P. 2001}}. The results are difficult to interpret as some participants may fall more because their level of activity has increased and some interventions are not monitored long enough to detect changes in fall rates (Choi et al., 2005).

This category of outcomes has a large body of research supporting the efficacy of Tai Chi on improving factors related to falls, and growing evidence that falls may be reduced. Longer term studies to examine fall rates, and parallel studies that utilize Qigong as the intervention may further clarify the potential of these forms of exercise to affect falls and balance.

### *Quality of Life*

Quality of life (QOL) outcomes were reported in 17 articles (Qigong, n=4 and Tai Chi, n=13). QOL is a broad ranging concept derived in a complex process from measures of a person's perceived physical health, psychological state, personal beliefs, social relationships and relationship to relevant features of one's environment (World Health Organization, 2002). In 13 studies of a wide range of participants (including healthy adults, patients with cancer, post-stroke, arthritis, etc.) at least one of the components of QOL was reported to be significantly improved by Tai Chi compared to inactive {{743 Galantino,Mary Lou 2005; 438 Hartman,C.A.

2000; 687 Irwin,Michael R. 2003; 653 Lee,Linda Y.K. 2007; 691 Li,Fuzhong 2002; 679 Mustian,Karen M. 2004; 678 Wang,C. 2005; 681 Yeh,Gloria Y. 2004}} or active controls {{434 Hart,Jacob 2004}}, and by Qigong compared to inactive {{715 Tsang,Hector W.H. 2003; 734 Tsang,Hector W.H. 2006}} or active control groups {{1136 Tsang,T. 2007}}. Qigong showed improvements in QOL compared to an exercise intervention, but not significantly so {{725 Cheung,B.M.Y. 2005}}.

Conversely, two studies reported no change in QOL, both with severely health-compromised individuals. One was of short duration (6 weeks) conducted with patients with traumatic brain injury (Gemmell & Leathem, 2006). Some improvement in coping was shown with muscular dystrophy patients in response to a Qigong intervention (Wenneberg et al., 2004), however, this finding was not significant, and direct QOL measures remained unchanged. One study reported no change in QOL when Tai Chi was compared to balance training and an education control among healthy older adults (Kutner, Barnhart, Wolf, McNeely, & Xu, 1997).

With a few exceptions, the preponderance of studies indicate that Qigong and Tai Chi hold great potential for improving QOL in both healthy and chronically ill patients.

### *Self-efficacy*

Self-efficacy is the confidence a person feels in performing one or several behaviors and the perceived ability to overcome the barriers associated with the performance of those behaviors (Baranowski, Perry, & Parcel, 2002). Although this is not a health outcome itself, it is often associated directly with health behaviors and benefits (e.g., falls self-efficacy associated with reduced falls), or with psychological health. Significant improvements in this outcome were reported in 8 studies (Qigong, n=2 and Tai Chi, n=6). Self-efficacy was generally assessed in the RCTs as a secondary outcome and reflected the “problem” area under investigation, such as falls

self-efficacy (i.e., feeling confident that one will not fall) or efficacy to manage a disease (arthritis, fibromyalgia) or symptom (pain). Self-efficacy for falls was significantly increased as a result of participation in Tai Chi in 3 studies with adults at risk for falls compared to wait-list or usual care, sedentary control groups (Choi et al., 2005; F. Li, Harmer, McAuley, Fisher et al., 2001; F. Li, Fisher, Harmer, & McAuley, 2005). In studies with clinical populations, persons with arthritis experienced improvements in arthritis self-efficacy (Hartman et al., 2000) and fibromyalgia patients experienced improvements in the ability to manage pain (Hammond & Freeman, 2006) after participating in Tai chi as compared to inactive control groups that provided social interaction (telephone calls and relaxation therapy respectively). Lastly, the perceived ability to handle stress or novel experiences (M. S. Lee, Lim, & Lee, 2004; H. W. H. Tsang et al., 2006) and exercise self-efficacy (Kutner et al., 1997; M. S. Lee, Lim et al., 2004) were enhanced relative to inactive control groups as a function of participation in Qigong and Tai Chi.

#### *Patient Reported Outcomes*

Patient reported outcomes (PROs) include reports of symptoms related to disease as perceived by the patient. The definition of PROs as “a measurement of any aspect of a patient's health status that comes directly from the patient, without the interpretation of the patient's responses by a physician or anyone else,”

([http://www.fda.gov/fdac/features/2006/606\\_patients.html](http://www.fda.gov/fdac/features/2006/606_patients.html))

(Accessed April 29, 2009)

has developed over the past decade as an important indicator of treatment outcomes that matter to the patient, including an array of symptoms such as pain, fatigue, and nausea. Although PRO

lists often include factors such as anxiety and depression, these are not included here, but rather in a separate section to address a range of psychological effects.

Thirteen studies are included in this category (Qigong, n=3 and Tai Chi, n=10). Arthritic pain (Brismee et al., 2007; Fransen et al., 2007; Song, Lee, Lam, & Bae, 2007; C. Wang et al., 2005) decreased significantly in response to Tai Chi compared to inactive (health education or usual care) controls. Self-reported neck pain and disability (Lansinger et al., 2007) improved to a similar degree for Qigong and an exercise comparison intervention, but the difference between groups was not significant. Fibromyalgia symptoms improved significantly in one study comparing Tai Chi to a relaxation intervention (Hammond & Freeman, 2006), while another study reported slight improvements in symptoms for both Qigong and a usual care control group with no significant difference between the groups (Mannerkorpi et al., 2004). Perceived symptoms of heart failure (Barrow et al., 2007), disability (Faber et al., 2006), and sickness impact scores (Greenspan et al., 2007) decreased in response to Tai Chi interventions as compared to inactive controls (either usual care or educational interventions) and sleep quality improved for Tai Chi even as compared to an exercise intervention (F. Li et al., 2004). With Tai Chi, dissociative experiences and symptoms improved clinically, but were not statistically different from gains achieved by a support group among male veterans (Winsmann, 2005). Parkinson's disease symptoms and disability were not significantly changed following a 7-week session of Qigong compared to aerobic training sessions (Burini et al., 2006).

With the wide range of symptoms, and irregular outcomes of these PROs studies, it is difficult to draw meaningful conclusions about this category. Pain consistently responded to Tai Chi in four studies, while other symptoms were not uniformly assessed.

### *Psychological*

Twenty-seven articles (Qigong, n=7 and Tai Chi, n=19 and one study using both Qigong and Tai Chi) reported on psychological factors such as anxiety, depression, stress, mood, fear of falling, and self-esteem. Most of these studies examined psychological factors as secondary goals of the study, and consequently, they often did not intentionally recruit participants with appreciable psychological distress. Nevertheless, a number of substantial findings dominate this category.

Anxiety decreased significantly for participants practicing Qigong compared to an active exercise group (Cheung et al., 2005; M. Lee et al., 2003; Tsai et al., 2003). Depression was shown to improve significantly in studies comparing Qigong to an inactive control, newspaper reading (H. W. H. Tsang et al., 2006) and for Tai Chi compared to usual care, psychosocial support or stretching/education controls (Chou et al., 2004; Mustian et al., 2006; C. Wang et al., 2005). General measures of mood (e.g, Profile of Mood States) were improved significantly for participants practicing Tai Chi compared to usual care controls (Galantino et al., 2005; Gemmell & Leathem, 2006; Jin, 1992) and for those practicing Qigong compared to a wait list control group (M. S. Lee, Lim et al., 2004).

Depression improved, but not significantly, for both Qigong and exercise comparison groups (Cheung et al., 2005; H. W. H. Tsang et al., 2003) and for Tai Chi compared to an educational intervention (M. R. Irwin et al., 2007). One study reported improved depression, anxiety, and stress among patients with osteoarthritis for both Tai Chi and hydrotherapy groups compared to a wait-list control, but only significantly so for hydrotherapy (Fransen et al., 2007).

Non-significant changes in anxiety were reported in a study of Tai Chi compared to a relaxation intervention (Hammond & Freeman, 2006) and two other studies did not detect significant differences in depression in response to Tai Chi (Barrow et al., 2007; Hammond &

Freeman, 2006) or Qigong (Wenneberg et al., 2004) compared to usual care or inactive controls. Fear of falling decreased significantly in most studies (F. Li et al., 2005; Sattin, 1992; S. L. Wolf et al., 1997; S. L. Wolf et al., 2003b; J. Zhang et al., 2006) except for one that showed no change (Stenlund et al., 2005). Reports of self-esteem significantly improved in tests of Tai Chi compared to usual care (L. Y. K. Lee et al., 2007; F. Li, Harmer, Chaumeton, Duncan, & Duncan, 2002) and psychosocial support (Mustian et al., 2004), but the increase in self-esteem compared to exercise and education controls was not significant (Kutner et al., 1997).

Jin (Jin, 1992) specifically created a stressful situation and measured the response in mood, self-reported stress levels, and BP, across 4 interventions, including Tai Chi, meditation, brisk walking and neutral reading. Significant improvements were shown in adrenaline, heart rate, and noradrenaline in Tai Chi compared to a neutral reading intervention, while all groups showed improvements in cortisol. In another study examining blood markers related to stress response, norepinephrine, epinephrine and cortisol blood levels were significantly decreased in response to Qigong compared to a wait-list control group (M. Lee et al., 2003).

This category of symptoms, particularly anxiety and depression, shows fairly consistent responses to both Tai Chi and Qigong, especially when the control intervention does not include active interventions such as exercise. In particular, with a few studies indicating that there may be changes in biomarkers associated with anxiety and/or depression in response to the interventions, this category shows promise for examining potential mechanisms of action for the change in psychological state.

#### *Immune Function and Inflammation*

Immune-related responses have also been reported in response to Qigong (n=3) and Tai Chi (n=3) studies. Manzanque et al. (Manzanque et al., 2004) reported improvements in a

number of immune-related blood markers, including total number of leukocytes, number of eosinophils, and number and percentage of monocytes, as well as the complement C3 levels following a 1-month Qigong intervention compared to usual care. Antibody levels in response to flu vaccinations were significantly increased among a Qigong group compared to usual care (Yang et al., 2007). Varicella zoster virus titers and T-cells increased in response to vaccine among Tai Chi practitioners (M. R. Irwin et al., 2007). An earlier study conducted by Irwin and colleagues (M. R. Irwin et al., 2003) reported an increase in varicella zoster virus specific cell-mediated immunity among those practicing Tai Chi compared to wait-list controls.

Immune function and inflammation are closely related, and are often assessed using a variety of blood markers, particularly certain cytokines and C-reactive protein. Interleukin-6, an important marker of inflammation, was found to be significantly modulated in response to practicing Qigong, compared to a no-exercise control group (H. H. Chen et al., 2006). On the other hand, C-reactive protein and erythrocyte sedimentation rates remained unchanged among a group of rheumatoid arthritic patients who participated in a Tai Chi class compared to stretching and wellness education (C. Wang et al., 2005).

A number of studies not utilizing an RCT design have examined blood markers prior to and after Tai Chi or Qigong interventions, providing some indication of factors that might be important to explore in future RCTs (and not reported in the table). For example, improvements in thyroid-stimulating hormone, follicle-stimulating hormone, triiodothyronine (Xu & Wang, 1986), and lymphocyte production (Sun, Xu, & Xia, 1989) have been noted in response to Tai Chi compared to matched controls. Pre-post Tai Chi intervention designs have also shown an improvement in immunoglobulin G (IgG) (G. D. Zhang, 1990) and natural killer (NK) cells (Z. Q. Li & Shen, 1995) and similar non-RCTs have suggested that Qigong improves immune

function and reduces inflammation profiles as indicated by cytokine and T-lymphocyte subset proportions (Jones, 2001; Ryu et al., 1995; Ryu, Mo et al., 1995).

As with the category of psychological outcomes, these immune and inflammation related parameters fairly consistently respond to Tai Chi and Qigong, while also providing potential for examining mechanisms of action.

## **Discussion**

*In answering Research Question 1, we have identified 9 categories of health benefits related to Tai Chi and Qigong interventions, with varying levels of support. Six domains of health-related benefits have dominated the research with sixteen or more RCTs published for each of these outcomes: psychological effects (27), falls/balance (23), cardiopulmonary fitness (19), QOL (17), PROs (18), and physical function (16). These areas represent most of the RCTs reviewed, with many of the studies including multiple measured outcomes spanning across several categories (n=42). Substantially fewer RCTs have been completed in the other three categories, including bone density (4), self-efficacy (8), and studies examining markers of immune function or inflammation (6).*

The preponderance of studies showed significant, positive results on the tested health outcomes, especially when comparisons were made with minimally active or inactive controls (n=52). For some of the outcomes addressed in this review, there were studies that did not demonstrate significant improvements for the Tai Chi or Qigong intervention as compared to the control condition. For the most part, however, these non-significant findings occurred in studies in which the control design was actually a treatment type of control expected to produce similar benefits, such as an educational control group intervention producing similar outcomes as Tai Chi for self-esteem (Kutner et al., 1997), aerobic exercise showing similar results to Qigong in

reducing depression (Burini et al., 2006; Cheung et al., 2005), an acupuncture group successfully maintaining weight loss compared to no intervention effect for Qigong (Elder et al., 2007), or resistance training producing similar (nonsignificant) effects as Tai Chi for muscle strength, balance, and falls (Galantino et al., 2005; Woo et al., 2007). *It is important to note that although the Tai Chi and Qigong interventions did not produce larger benefits than these active treatment controls, in most cases substantial improvements in the outcome were observed for both treatment groups.*

Other studies in which the improvements did not significantly differ between the treatment group and the control group suffered from: (a) study designs of shorter duration (4 to 8 weeks, rather than the usual 12 or more weeks) (Channer et al., 1996; Gemmell & Leathem, 2006) although there were some exceptional studies with significant results after only 8 weeks (M. S. Lee et al., 2004; M. S. Lee, Lim et al., 2004; J. Zhang et al., 2006); (b) selection of very health-compromised participants or individuals with conditions that do not generally respond to other conventional treatments or medicines such as muscular dystrophy (Wenneberg et al., 2004), multiple morbidities (S. L. Wolf et al., 2006), fibromyalgia, (Mannerkorpi et al., 2004) or arthritis (C. Wang et al., 2005); or (c) the outcome measured was not noted as particularly problematic nor set as an eligibility criteria for poor starting levels at baseline (n=5) (Cheung et al., 2005; H. W. H. Tsang et al., 2003).

*On the other hand, in the areas of research that address outcomes typically associated with physical exercise, such as cardiopulmonary health or physical function, results are fairly consistent in showing that positive, significantly larger effects are observed for both Tai Chi and Qigong when compared to no-exercise control groups and similar health outcomes are found when compared to exercise controls.* Even with the very wide range of study design types,

strength of control interventions, and the entry level of the health status of study participants, there remain a number of remarkable and persistent findings of health benefits in response to both Qigong and Tai Chi.

In response to Research Question 2, we have noted in earlier sections the ways in which Qigong and Tai Chi are considered equivalent, and now address how studies identifying similar outcomes in response to these practices may provide additional evidence for equivalence. On the surface, research that examines the effects of Qigong on health outcomes appears to be of lesser magnitude than the research on what is typically called Tai Chi. *For each category of outcomes described above, we noted how many RCTs had been conducted for each, Tai Chi and Qigong, and for the most part, there were many fewer reports on Qigong than for what is named Tai Chi for any given outcome examined. Nevertheless, across the outcomes examined in RCTs, the findings are often similar, with no particular trends indicating that one has different effects than the other.*

*As noted earlier, however, it is not unusual for the intervention used in a study or trial to be named Tai Chi, but to actually apply a set of activities which is more a form of Qigong, that is, easy-to-learn movements that are simple and repeatable rather than the long complex sequences of traditional Tai Chi movements that can take a long time to learn. For example, a large number of studies examining Tai Chi effects on balance use a modified, repetitive form of Tai Chi which is more like Qigong. Thus, while it appears that fewer studies have been conducted to test what is called Qigong, it is also clear that when a practice called Tai Chi is modified to focus, especially on balance enhancement, for example, it actually may be Tai Chi in name only.*

*Given the apparent similarity of practice forms utilized in research, the discussion of equivalence of Tai Chi and Qigong extends beyond the earlier observation that they are similar in practice and philosophy. Since research designs often incorporate blended aspects of both Qigong and Tai Chi, it is unreasonable to claim that the evidence is lacking for one or the other and it becomes inappropriate not to claim their equivalence. We suggest that the combined current research provides a wider base of growing evidence indicating that these two forms produce a wide range of health-related benefits.*

*The problem with claiming equivalence, then, does not lie within the smaller number of studies using a form called Qigong, but rather in the lack of detail reported across the studies regarding whether or not the interventions contain the key elements philosophically and operationally thought to define meditative movement practices such as Tai Chi and Qigong. In previous publications, and in this review, we note that the roots of both of these TCM-based wellness practices require that the key elements of meditative movement be implemented: focus on regulating the body (movement/posture); focus on regulating the breath; and focus on regulating the mind (consciousness) to achieve a meditative state. Given the equivalence noted in foundational principles and practice, the differences among interventions and resultant effects on outcomes would perhaps more purposefully be assessed for intervention fidelity (i.e., adherence to the criteria of meditative movement).*

*Beyond the meditative movement factors that tie the practices and expected outcomes together, other, more conventional factors would be important to assess, each potentially contributing to variations in outcomes achieved. For example, dosing (i.e., frequency, duration and level of intensity, including estimate of aerobic level or metabolic equivalents) may be important in whether or not benefits accrue. Or, a focus on particular muscle groups may be*

*critical to understanding changes relative to certain goals (e.g., how many of the exercises chosen for a study protocol develop quadricep strength likely to produce results for specific physical function tests?). Beyond the important similarities of movement and a focus on breath and mind to achieve meditative states, there are other aspects that vary greatly within the wide variety of both Tai Chi and Qigong exercises, including speed of execution, muscle groups used and range of motion, all of which may provide differences in the physiologically-oriented outcomes (similar to the differences that could be noted in the wide variety of exercises considered under the aerobic “umbrella”).*

*The question of the equivalence Tai Chi and Qigong, then, may be helpful if the focus is on similarity in philosophy and practice. With consistent reporting on adherence to the above mentioned aspects of practice, not only could a level of standardization be implemented, but also measures that control for variation of interventions could be used to better understand differences and similarities in effects (Larkey et al.,2009).*

### **Limitations**

For purposes of this review, a study was selected if it was designed as an RCT and compared the effects of either Tai Chi or Qigong to those of a control condition on a physical or psychological health outcome. However, there was no further grading of the quality of the research design. As a result of this relatively broad inclusion criterion, the studies represent a wide variety in methods of controlling for balanced randomization and intent to treat analyses, in the specific methods of implementing Tai Chi and Qigong, in the outcomes assessed, in the measurement tools used to ascertain the outcomes, and in the populations being studied.

*One difficulty in examining such a broad scope of studies is that the large number of studies required that we logically, but artificially, construct categories within which to discuss*

*each group of outcomes. However, by choosing to categorize by health outcomes, rather than participant, patient or disease types, we have provided one particular view of the data, and may have obscured other aspects. For example, in a recently published review, the authors analyzed studies that were conducted with community-dwelling adults over the age of 55 (Rogers, Larkey, & Keller, 2009). Results showed that interventions utilizing Tai Chi and Qigong may help older adults improve physical function and reduce blood pressure, fall risk, and depression and anxiety. Another view of these data may emerge if only studies of chronically ill participants are evaluated. Thus, there may be other ways to examine the RCTs reported in the current review such that specific diseases or selected study populations may reveal more consistent findings (positive or negative) for certain outcomes that are clearly tied to entry level values.*

## **Conclusion**

A compelling body of research emerges when Tai Chi studies, and the growing body of Qigong studies are combined. The evidence suggests that a wide range of health benefits accrue in response to these meditative movement forms, some consistently so, and some with limitations in the findings thus far. This review has identified numerous outcomes with varying levels of evidence for the efficacy for Qigong and Tai Chi, including bone health, cardiopulmonary fitness and related biomarkers, physical function, falls prevention and balance, general quality of life and patient reported outcomes, immunity, and psychological factors such as anxiety, depression and self-efficacy. A substantial number RCTs have demonstrated consistent, positive results especially when the studies are designed with limited activity for controls. When both Tai Chi and Qigong are investigated together, as two approaches to a single category of practice, meditative movement, the magnitude of the body of research is quite impressive.

## ***So What?***

### *Application to research*

*The current state of research splinters these TCM-based wellness practices by identifying them with different names, and treating them as separate and different methodologies. Our intent has been to recognize the common critical elements of Qigong and Tai Chi, based on the similarities in philosophy and practice and the range of findings for similar health outcomes, and to treat the two as equivalent forms. Studies in the future should acknowledge these elements, and even test for intervention fidelity, to assure that the practices do, in fact, reflect the guiding principles of Tai Chi and Qigong. Beyond this we assert that it is critical to begin delineating the practice characteristics that actually do differ both between and within these practices, so that a more specific body of knowledge can begin to accumulate about the types of practices, the component features of the practices and their effects on health-related outcomes.*

Some studies of these forms of meditative movement indicate that study participants with severe, chronic, progressive illnesses may be slower to respond or not respond at all to the practices. Interestingly, however, other studies suggest that these practices may improve or slow the progression of such illnesses. This may be especially likely when the practices are implemented early as an aspect of wellness, prevention or disease management in a proactive, risk reduction context. These findings suggest that continued research on these and other forms of meditative movement is warranted for a broad number of conditions and across populations.

*The wide variations in populations and outcomes studied, descriptions of interventions (or the lack of such description), reports of dose, and the extreme variety in the sorts of tools used to assess outcomes, point to the need to develop more standardized protocols and trends in measurement for the field of meditative movement research.*

*Application in health promotion*

The preponderance of findings are positive for a wide range of health benefits in response to Tai Chi, and a growing evidence base for similar benefits for Qigong. *As described, the foundational similarities and the often adapted Tai Chi protocols which more closely resemble forms of Qigong, allow us to suggest that outcomes can be counted across both types of studies, further supporting claims of equivalence.*

*In a recent review addressing Tai Chi and Qigong research among older adults, it was pointed out that no adverse events were reported across studies (Rogers, Larkey, Keller). The substantial potential for achieving health benefits, the minimal cost incurred by this form of self-care, and the apparent safety of implementation across populations, points to the importance of wider implementation and dissemination. The health promotion challenge is that both Tai Chi and Qigong are still often considered novel forms of exercise and adopted by a small market segment of our population. On the positive side, however, there is a rapid increase of visibility of what is popularly referenced as Tai Chi which is known as an effective intervention for balance enhancement and falls prevention among the elderly, and there is a growing interest in safe, alternative forms of exercise across all age groups. Tai Chi and Qigong interventions provide an accessible alternative option for individuals who may prefer these activities over more conventional or vigorous forms of exercise. The growing interest in these forms of exercise that include a mindful focus on the breath and meditation provides an opportunity for changing the landscape of personal choice making and shifts the motivations that people have to exercise, while presenting an entirely new set of exercise research opportunities. This suggests that Tai Chi and Qigong (or more generally, meditative movement types of exercise) may provide an attractive and effective exercise alternatives for the large populations of people at risk for*

*preventable disease, sedentary, and lacking the motivation to engage in more conventional exercise.*

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