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Qigong among older adults: a global review

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Abstract

The review focuses on the state of global Qigong research regarding its prevalence and practice, practitioner characteristics, and its effects on health among older adults. Qigong is a Chinese traditional practice that has been developed for thousands of years for the purposes of improving and sustaining health, and its ease of practice has appealed to older adults and those who wish to find non-biomedical ways to address their health concerns. It is practiced throughout the world, and its practitioners report better health than their non-practitioner counterparts according to cross-sectional, longitudinal, and retrospective studies. Trial research has also shown that Qigong is effective at improving many health outcomes, especially in regard to chronic physical and psychological conditions. Many research gaps exist, especially concerning study design and any investigation into the role of culture in Qigong practice. Future research should closely examine the feasibility and adaptability of Qigong exercise, health outcomes, and exercise adherence for individuals in advancing age, while also evaluating the effects of Qigong versus other forms of mind-body exercise and whether cultural specificity and CAM beliefs affect health outcomes. Last, researchers, health providers, and community leaders should investigate and improve the physical and psychosocial health and health behaviors of older adults through culturally appropriate and adaptable exercises like Qigong.

Introduction

Qigong is a traditional Chinese medicinal practice which is believed to help channel energy (*Qi*) to various parts of the body in order to promote health [1]. Its practice has been developed over thousands of years in China and includes many different forms which may be tailored toward addressing specific ailments ranging from cancer to arthritis to poor immune function [2]. In general, Qigong practice includes specific body movements, breathing patterns, and meditation and can be practiced both internally, by the individual, or externally, by a trained Qigong master [3]. There is great variety in Qigong forms, and it can be performed sitting or standing, typically with an emphasis on either movement or meditation [2]. The overarching goal of any *Qi* energy practice, which also includes Tai Chi, acupuncture, reiki, and martial arts, is to nurture and maintain balance within the body as a means to good health. Thus, Qigong is commonly included in the larger category of "mind-body" techniques.

Qigong has been a large part of Chinese history and health practices, but its appeal and scope extends beyond the confines of traditional Chinese culture. In the mid-twentieth century, Qigong became known as *zuguo yixue yichan*, (中國醫學遺產) or a "national medical heritage," which formally recognized Qigong in the Chinese state's medical system, largely due to its traditional origins in Daoist practices [4]. Qigong has transitioned from relegation in the traditional Chinese medicine sphere to a broader application including scientific inquiry as a result of globalization and a changing political climate [4] and the global application and practice of Qigong in non-Chinese spaces. In addition to its continued and popular practice in China [5,6], Qigong is practiced around the world, in countries such as the U.S. [7], Taiwan [8], Singapore [9], Canada [10], and Sweden [11], which points to its global relevance as a medical practice. There is some indication that traditional Chinese medicine practices can change significantly once adopted by non-Chinese individuals or those who endorse western medical practices [12]. Therefore, the globalization and modernization of Qigong indicates there may be many more permutations of Qigong than are indicated in historical Chinese record.

An individual's culture and beliefs are an important component of all medical care, whether or not it is classified as traditional, biomedical, psychological, or anywhere in-between. Research in the U.S. has found that personal beliefs are correlated with the decision to practice or use Complementary and Alternative Medicine (CAM), regardless of ethnicity [13]. In medically pluralistic countries, biomedicine may take a prevailing position, but mind-body practices like Qigong remain popular due to cultural ideas of health which cannot be addressed in biomedical practices [14]. The inclusion of traditional medicine in our global health research, policies, and practices may help to achieve a more holistic and person-centered healthcare system, especially among under-represented minority populations [15-17].

Qigong warrants greater attention in research, both as a popular health practice and as a possible intervention for older adults. CAM may be particularly appealing to older adults for multiple reasons. According to the World Health Organization, CAM is appealing due to its safety, quality, efficacy, cost, and accessibility [18]. Further, CAM treatments often focus on the comprehensive health and quality of life of an individual [19], which may be helpful when addressing chronic symptoms where there is not cure. In the U.S., it is estimated that 89.7% of older adults suffer from at least one chronic condition; 35.9% have five or more chronic conditions [20]. There is some evidence that older adults use CAM for chronic conditions [21], as well as anecdotal evidence that Qigong is popular among older adults for the same reasons [14]. Qigong, in particular, is a CAM modality which is easy to learn [3], can be adapted for many different ongoing conditions,

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including arthritis, blood disorders, memory problems, and depression [2], and may reduce health costs and medical visits [10].

The aims of this review are to understand 1) the prevalence of Qigong practice and characteristics of older adult practitioners globally; 2) the health effects of Qigong practices among older adults; and 3) research gaps in and implications of the practice of Qigong and its impact on the health of the global aging population.

Methods

The authors conducted separate searches of global literature in English and Chinese databases for thoroughness. For English language publications, the search was conducted on Google Scholar. The searched keywords included the following: older adults, qigong, health, Baduanjin, *Qi* therapy, *Qi* training, and external *Qi*. In addition, references from 18 most recent review papers on Qigong were included [2,3,22-36], which were selected based on publication after 2005. Exclusion criteria included non-English language, graduate theses, abstracts, publication date before 1995, insufficient data, did not include adults age 60 and over, only physiological data, and any duplicates across review papers. Full methodology for English publications is shown in Figure 1a. For Chinese language publications, the search was conducted using CNKI including the keywords Qigong (氣功), Baduanjing (八段錦) Wuqinxi (五禽戲), Yijinjing (易筋經), and Liuzijue (六字訣). Exclusion criteria included articles published before 2000, non-academic publications or unpublished manuscripts, unrelated content, graduate theses, did not include adults age 60 and over, lack of data or only physiological data. Full methodology for Chinese publications is shown in Figure 1b.

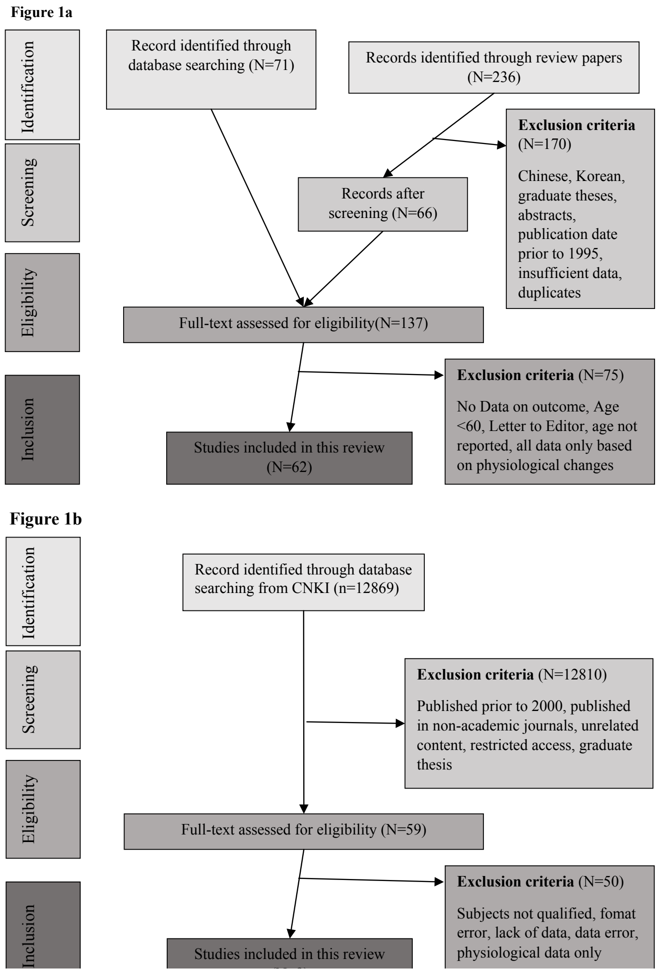

Figure 1:

Results

Our search yielded 62 English-language results and 9 Chinese language results for a total of 71 articles, which were then grouped into several categories: prevalence, practitioner characteristics, non-randomized control trial (RCT) health outcome studies, and RCT health outcomes studies.

Global prevalence and practice of Qigong

Table 1 introduces the prevalence of Qigong practice globally. Five papers were found. The three papers about Qigong practice prevalence all came from various waves of the National Health Interview Survey (NHIS), which estimates Qigong practice in the past twelve months by adults is 0.3% [37,38]. According to Barnes *et al.* [37], this equates to about 500,000 Qigong practitioners and 70% of those also practice Tai Chi. The 2002 NHIS survey estimates that 0.1% of male cancer survivors and 0.5% of female cancer survivors practice Qigong [39]. Last, a 1999 survey of over two thousand older adults in Singapore finds that 3.5% of those surveyed practice Qigong [9].

Practitioner characteristics associated with Qigong

Table 2 introduces the socio-demographic and health characteristics of practitioners. Six papers were found with 1,574 Qigong practitioners surveyed. Four out of six studies examine western populations. Regarding sociodemographic characteristics, Komelski *et al.* [40] examined Tai Chi Qigong practitioners versus non-practitioners and found a non-significant age difference and higher income (p<.001) and education levels (p<.001) in a cross-sectional study. Jouper *et al.* [11] surveyed reasons for practice among 253 Biyun Qigong practitioners in Swedish and found that 48% were curious, 9% desired a low-impact activity, 19% wanted to promote their health, and 24% wished to recuperate from illness.

Qigong practice is positively correlated with self-reported health status and quality of life and has better health status compared to various non-Qigong groups [8,11,40,41]. Ho *et al.* (2011) [8] found in a cross-sectional survey of 825 individuals that Qigong practitioners in Taiwan are more likely to have better quality of life (p<.01) and less likely to have diabetes (p=.01), heart disease (p<.001), and hypertension (p<.001) versus non-practitioners. A cross-sectional study in Sweden of Biyun Qigong practitioners found that 52% of those surveyed continue practice due to better perceived psychological well-being and 24% continue practice due to better physical health [11]. Similarly, a U.S. cross-sectional study showed Tai Chi Qigong practitioners have significantly better self-reported health compared to a group of moderate exercisers (p<.001) [40], and a retrospective study in Korea found 40.2% of nearly 800 participants reported improvement in health after practicing ChunDoSunBup [41]. Additionally, in a study of Qigong meditators versus non-meditators, Qigong practitioners had a significantly lower neuroticism score (mean QG = 7.14 ± 4.45, mean NP = 10.15 ± 4.73, p<.0001), and years of practice was significantly correlated with lower neuroticism (r^2= 0.69, p<.001) [42]. Last, a prospective study in Canada also found that Yanxin Qigong

Table 1. Prevalence and Practice of Qigong by Country.

Author (Year)	Population Setting	Demographics	Survey Method	Survey Response Rate	Prevalence
U.S.					
Olano *et al.* (2015) [38]	69,149 adults representing approximately 170 million adults	18 and older, 51% Women, 4.4% Asian. Mean age: 45.0 (0.11)	2002, 2007, and 2012 National Health Interview Survey (NHIS), in person	Not reported	0.3% practice QG in the past 12 months
Fouladbakhsh and Stommel (2010) [39]	2,262 cancer survivors	Aged 18 years and older. 1,371 female, mean age 59.5, and 891 male, mean age 65.3	Cross-sectional, 2002 NHIS survey, in person	Not reported	0.1% men, 0.5% women practiced QG
Birdee *et al.* (2009) [7]	31,044 civilian, noninstitutionalized, household population adults	NR	2002 NHIS, in person	74%	500,000 Qigong users in the U.S. Among QG practitioners, 70% also reported practicing tai chi.
Barnes *et al.* (2008) [37]	31,044 civilian, noninstitutionalized household adults	23,393 adults and 9,417 children in 2007	2002 and 2007 NHIS, in person	2002: 74.3% 2007: 67.8% (adult), 76.5% (child)	0.3% adults practiced in 2002 and 2007
Singapore					
Lian *et al.* (1999) [9]	2494 older adults 60 years and older	37.4% ages 60-64; 57.8% female; 88.1% Chinese and 63.1% married	Cross-sectional, in person	88.8%	3.5% practiced QG

QG=Qigong; National Health Interview Survey=NHIS; NR=Not reported

Table 2. Practitioners Characteristics Associated with QG.

Author (Year)	Study design	Population Characteristics						Methods	Outcome of Interest	Measurement	Critical Findings
		#	Country	Age: mean (SD), range	Sex: Male, Female	Previous QG Practice	Type of QG				
Yan *et al.* (2013) [10]	PS	188	Canada	45 (11.42), 18-82	63% female	Average practice time about 35 months (Range 7-81 months)	YXQG	7 year follow up	Study relationship between medical cost/ utilization and YXQG practice	1) Monthly medical visits 2) Monthly total cost of medical visits	1) The average monthly medical visit for the participants was 0.97 before practicing YXQG and 0.71 after practicing YXQG. (p<.05). 2) The average monthly cost of the sampled individuals before practicing YXQG was $41 and $30 after practicing YXQG. (p<.05)
Komelski *et al.* (2012) [40]	CS	120 TQG 414,629 nationally representative sample	US	TQG: 54.78 (10.73), 24-83 Comparison: 54.86 (16.74), 18-99	TQG: 57M, 62F Comparison: 155,703M, 258,806F	NR	TQG	Comparison between TQG, some exercise, and no exercise	Examine and compare health status of TQG practitioners and nationally representative sample	1) demographics (age, income, education) 2) Self-reported Health (0-4, poor to excellent)	1) NS age difference. TQG higher income than some exercise and no exercise group (5.90±1.74 vs. 4.65±2.15, p<.001) TQG higher education than some exercise and no exercise group (4.76 ±0.56 vs. 3.79±1.09, p<.001) 2) TQG Exercise group had the significant highest mean on self-reported health, followed by the Some Exercise group and then the No Exercise group (3.09±0.85 vs. 2.62±1.03 vs. 1.94±1.15, p<.001).
Ho *et al.* (2011) [8]	CS	825 165 WTK 660 NP	Taiwan	QG: 44-90 NP: matched	41.2% M, 58.8% F	Over half a year or regularly practiced at least two hours per week for 26 weeks	WTK	In-person, cross-comparison with NHIS data of sedentary individuals or other exercise practitioners	To compare health between WTK practitioners and non-practitioners	1) Quality of life (SF-36) 2) health behaviors and chronic diseases	WTK practitioners versus comparison group: 1) More likely to have better physical functioning (86. 8±14.9 vs. 78.6±23.5, p<.001), fewer role limitations due to physical problems (82.3±31.5 vs. 65.8±43.5, p<.001), less bodily pain (82.3±15.1 vs. 74.9±22.9, p<.001), better general health (75.8±17.4 vs. 59.3±22.7, p<.001), better vitality (72.1±16.7 vs. 62.8±20.1, p<.001), and better general mental health (76.5±14.6 vs. 72.3±17.4, p<.01). 2) More likely to be occasional drinkers (18.8% vs. 9.4%, p=.001), have never smoked (79.4% vs. 78.0%, p=0.02), and exercise more than 1000 kcal/week (84.2% vs. 29.9%, p<.001). Less likely to have diabetes (5.5% vs. 12.1%, p=.01), heart disease (3.6z% vs. 18.5%, p<.001), hypertension (16.4% vs. 33.2%, p<.001)

Jouper *et al.* (2006) [11]	CS	253	Sweden	58 (13)	38M, 215F	Recruited from Qigong association 77 participants were instructors (Jichugong 35%, Donggong 16%, Senior gong 49%) Average completed 4±4 Qigong courses	Biyun method	Mail survey	Describe how Swedish people practice QG and reasons for practice	1) demographic characteristics 2) QG practice behavior 3) outcomes related to exercise	1) Average height 168 (8) cm, body mass 67.5 (10) kg. Lived with partner (67%), had university degree (57%). 44% were employed, 45% retired and 11% were students. 2) Reasons for practice: curiosity (48%), low-impact activity (9%), promote health (19%), recuperate from illness (24%). Practiced Qigong for average 5 (SD=3) years with 4.8 (1.9) sessions per week.65% prefer to exercise alone, 90% at home. 59% morning. Qi was perceived as an internal force by 47%, an emotional state by 41%, and enhances body awareness by 12%. All participants had supplemental physical exercise for an average of 49 minutes per day. 3) 52% continue practice due to perceived better psychological well-being, 24% for physical health preservation, and 24% to recuperate from illness. Health-now was rated by the group as 6.9±1.9 on the 10-point scale, and health-before commencing Qigong practice as 4.8±2.3, a statistically significant difference (t (248) = 32.3, $p<.05$). Health-now was also positively correlated with session-time (0.17, $p<.01$), years of practice (0.15, $p<.05$) and number of Qigong courses (0.14, $p<.05$). Number of sessions, education, being an instructor, nor performing other forms of exercise was correlated to health-now (all ps>0.10)
Leung and Singhal (2004) [42]	CS	154 80 QG 74 NP	Canada, U.S., Europe	QG: 47.5, 23-69 NP: 42, 28-73	QG: 45M, 35F NP: 29M, 45F	Mediation: practice daily for at least 12 months NP: 20 practiced QG <12 months	QG meditation	Online, cross-compare with NP	Investigate if QG meditation relates to personality	1) Personality: extraversion and neuroticism (EPI)	1) After controlling for age, gender, and education, years of Qigong practice and neuroticism negatively correlated (r= -.2184, $p<.004$). Significant difference in neuroticism between QG and NP (mean QG = 7.14±4.45, mean NP = 10.15±4.73, $p<.0001$). No significant different in extraversion score between QG and NP (mean QG group = 13.75±3.05, mean NP =14.04±3.45, $p>.05$) Significant strength and predictability between number of years of QG practice and neuroticism (r^2= 0.69, $p<.001$).
Lee *et al.* (2003) [41]	RS	768	Korea	Ages 16-30 (31.4%), 31-45 (33.9%), 46-60 (21.3%), 61+ (13.4%)	505M, 263F	Practiced for at least 4 months in 1995	CDSB	Ten years of subjects' memoranda	Investigate experience of medical conditions and recovery after QG practice	1) Health issues 2) Improvement 3) Motivation 4) Demographic Characteristics	1) Psychological (43.8%), musculoskeletal (32.4%), gastrointestinal (29.9%) 2) 82.8% reported improvement in psychological symptoms, 76.8% improvement in musculoskeletal symptoms, 73.3% improvement in gastrointestinal symptoms 66.9% reported improvement in physical health, 40.2% improvement in overall psychological health 51.8% reported marked improvement in recovery time of wound healing, 66.6% reported marked improvement in inflammation during wound healing 3) 81.5% reported practicing QG for health problems 4) More men (65.8%) then women (34.2%), most completed a high school education (43.8%)

SD=Standard deviation; QG=Qigong; CS=Cross-sectional study; WTK=Waitankung; NP=Non-practitioners; EPI=Eysenck Personality Inventory; NR=Not reported; TQG=Tai Chi Gong; NS=Not significant; PS=Prospective study; YXQG=Yanxin Qigong; RS=Retrospective study; CDSB=ChunDoSunBup practitioners had fewer monthly medical visits and fewer healthcare costs after starting to practice Qigong [10].

Health effects of Qigong in non-RCT studies by primary outcome of interest

Table 3 presents 13 non-RCT studies from 12 articles which focus on the effects of Qigong on cancer (n=1), diabetes (n=1), musculoskeletal (n=4), physical function (n=2), and psychological (n=5) outcomes. Three out of ten studies examined the effects of external Qigong therapy (EQT) by a Qigong master, while the remaining seven examined the effects of internal Qigong of various types. The EQT studies have small sample sizes of 13 or fewer individuals [43-45]. Only three studies reported including participants of East Asian decent [45,46]. Study design varies widely, ranging from evaluating changes after one 30-minute session of Qigong [47] to a 6-month program of Qigong exercise [48].

Table 3. Non-RCT on QG by Primary Outcome of interest.

Author (Year)	Study design	Population Characteristics						Methods	Outcome of Interest	Instrument	Critical Findings
		#	Country	Age: mean (SD), range	Sex	Previous QG Practice	Type of QG				
Cancer											
Cohen *et al.* (2010) [45]	Single-arm pre-post	9	5 US, 4 China	45-70	9F	None	EQT	5 consecutive days of EQT, each treatment 2-5 minutes	Test effects of EQT on breast cancer tumors and quality of life	1)Tumor size US: ultrasound and mammogram, China: ultrasound and magnetic resonance imaging, both: physical breast examinations 2) Quality of Life (FACT-G)	1) No clinically significant change for all patients (data not shown) 2) Non-significant changes in quality of life, pre versus post (98.3±13.7 vs. 94.7±14.6, p=0.92)
Diabetes											
Liu *et al.* (2010) [49]	OS	11	AU	42-65	3M, 8F	NR	TC/QG	Attended 3 training classes (60-90 minutes) per week for 12 weeks, received DVD and were encouraged to practice at home	Test effects of a TC/QG exercise program	1) Hematological measurements (fasting venous blood sample) 2) Quality of life (SF-36) 3) Physical measures (waist circumference, BMI, Resting BP) 4) Psychological measures (PSQ; CES-D)	Mean difference between baseline and post-intervention 1) improved hematological measurements: HbA1c (-0.32±0.26%, p<.01), insulin resistance (-.53±0.65 HOMA units, p<.05) 2) improved quality of life: SF-36 mental health summary score (5.13±7.12, p<.05), subscales for general health (19.00±14.19, p<.01), mental health (10.55±10.32, p<.01) and vitality (21.18±26.20, p<.05) 3) improved physical measures: BMI (-1.05±0.63, p<.001), waist circumference (-2.80±3.24 cm, p<.001), systolic BP (-11.64±11.64 mmHg, p<.01), diastolic BP (-9.73±5.73 mmHg, p<.001) 4) improved psychological health: stress (-2.27±3.17, p<.05), depressive symptoms (-3.60±3.95, p<.05)
Musculoskeletal											
Chen and Liu (2004) [43]	Open trial	10	US	58, 20-76	3M, 7F	None	EQT	3 days, Qigong healer administers qi for 5-10 min	Test effectiveness of Qigong on arthritis symptoms	1) Pain (VAS) 2) Mood (VAS) 3) Pain relief (VAS) 4) Physical function (ADL) 5) Anxiety (Spielberger State-Trait Anxiety) 6) Swollen/tender joint count by rheumatologist	6 completed pilot trial 1) All 6 reported reduction in VAS pain (mean reduction=34.7) 2) 5 out of 6 reported reduction in negative mood (mean reduction=34.2) 3) 5 out of 6 reported increased relief, 1 unchanged (mean increase=10.2) 4) Mean decrease in physical disability scores = -5.2 5) Mean decrease in Anxiety state score = -11.8 6) 4 out of 6 decreased active pain/tender joint counts. (overall mean=-1.5)
Sawynok *et al.* (2013) [48]	OT	20	Canada	53 (9.3)	13 F	Completed level 1 movement training	CFQ	Level 2 meditation training (two half-day trainings), 60 min/day for 8 weeks and continued for 6 months	Test effects of CFQ on fibromyalgia symptoms	1) Pain (NRS-PI) 2) Fibromyalgia impact (FIQ) 3) Sleep quality (PSQI) 4) Physical and mental functions (SF-36)	13 completed and included in analysis Outcomes, baseline versus 6 months: 1) less pain, mean 5.7±1.8 vs. 3.6±2.5, p=0.012 2) less impact, mean 50.9±16.5 vs. 29.7±17.6, p=0.036 3) better sleep quality, mean 11.5±3.6 vs. 8.5±4.2, p=0.004 4) better physical function: mean 36.2±9.4 vs. 42.9±10.7, p=0.004 Mental: mean 41.0±11.2 vs. 48.1±9.0, NS

Liu *et al.* (2012) [50]	Case studies	2	US	P1) 55 P2) 63	F	NR	NR	6-week Qigong exercise, twice a day	Test effect of QG on fibromyalgia related issues	1) Pain (SF-MPQ) 2) Fatigue (MFI-20) 3) Sleep quality (PSQI) 4) Fibromyalgia Impact (FIQ) 5) Depression (BDI-II)	Significance not reported Case 1: 1) Decreased pain: 28 to 12 2) Decreased fatigue: 79 to 58 3) Better sleep quality: 17 to 10 4) Decreased impact: 58.8 to 21.1 5) Decreased depressive symptoms: 17 to 8 Case 2: 1) Decreased pain: 36 to 22 2) Decreased fatigue: 86 to 70 3) Better sleep quality: 12 to 4 4) Decreased impact: 72.0 to 37.5 5) Decreased depressive symptoms: 28 to 8
Chen *et al.* (2006) [44]	Pilot	13	US	49.8, 23-66	13F	None	EQT	5-7 40 to 45 minute sessions over 3 weeks with Qigong healer, pre and post assessment and 3 month follow up	Evaluate EQT in treating effects of fibromyalgia	1) Fibromyalgia impact (FIQ) 2) Tender point count by physician evaluation 3)Depression (BDI-II) 4) Sleep quality (PSQI) 5) Anxiety (STAI) 6) Self-efficacy (LSE) 7) Pain (MPQ)	Baseline vs. 3-month (n=8) 1) less impact: mean 70.1±11.1 vs. 43.4±29.9), p<0.05 2) fewer tender points: mean 136.6±20.3 vs. 68.4±57.7, p<0.01 3) less severity of depression: mean 24.3±11.7 vs. 9.9±8.4, p<0.01 4) Non-significant sleep quality change: mean 13.5±4.1 vs. 11.4±5.3, NS 5) less anxiety: mean 26.9±11.9 vs. 12.7±14.5, p<0.05 6) increased self-efficacy: mean 39.0±18.7 vs. 72.3±29.1, p<0.01 7) less pain: mean 27.0±13.4 vs. 11.8±16.2, p<0.05
Physical function											
Sakata *et al.* (2008) [46]a	OS	72	Japan	70.9 (4.8), 60-86	72F	None	Floor 6-style Qigong Shaolin internal Qigong	12 weeks 90-min Qigong exercise program each week (45-min Qigong exercise, 20-min Qigong lecture and rest, option 25-min walking in a swimming pool or ergometer exercise 20 min daily Qigong at home	Determine the effects of a 12-week Qigong and aerobic exercise program on the physical well-being of relatively healthy elderly Japanese women	1) Physical function: lung capacity (mL), reaction time (s), flexibility, walking ability, balance 2) Body composition: Bone mineral content, body fat, soft tissue lean mass	Mean baseline vs. post-intervention 1) greater lung capacity in ml (1,992.3±476.0 vs. 2,092.2±456.2, p<.05) No significant change in reaction time in seconds (0.431±0.070 vs. 0.437±0.065, NS) Increased trunk bending ability in cm (16.6±8.9 vs. 20.7±7.5, p<.05) Faster normal walking in seconds (21.3±2.9 vs. 20.5±3.0, p<.05) Longer stork stand in seconds (44.7±34.5 vs. 52.1±33.0, p<.05) 2) No significant change in bone mineral content in kg (1.10±0.19 vs. 1.10±0.19, NS) Lower fat mass in kg (17.15±5.27 vs. 16.66±5.18, p<.05) Increased lean soft tissue mass in kg (33.95±3.66 vs. 34.28±3.50, p<.05)
Sakata *et al.* (2008) [46]b	OS	58	Japan	64-71 1) 67 (1.3) 2) 67.5 (2.0)	58F	None	Floor 6-style Qigong Shaolin internal Qigong	2 groups: 1) Qigong and aerobic exercise (n=29) 90-min qigong exercise program each week (45-min Qigong exercise, 20-min Qigong lecture and rest, option 25-min walking in a swimming pool or ergometer exercise 20 min daily Qigong at home 2) Qigong alone (n=29) (walking in swimming pool or ergometer exercise not offered)	Determine the effects of a 12-week Qigong and aerobic exercise program on the physical well-being of relatively healthy elderly Japanese women	1) walking ability, balance	No significant mean differences between groups, and both groups showed significant improvement in walking and rising between baseline and post intervention Group 1: faster walking in seconds (21.3±1.9 vs. 19.6±1.8, p<.05) Faster rising from sitting position in seconds (3.9±0.8 vs. 3.2±0.8, p<.05) Group 2: faster walking in seconds (21.2±1.9 vs. 19.7±1.8, p<.05) Faster rising from sitting position in seconds (3.9±0.8 vs. 3.3±0.9, p<.05)
Psychological											

Wu *et al.* (2014) [53] #	Trails	62	China	53 (4), 41-60	28M, 34F	none	BDJ	2 weeks, 3 x week, 30 min each Data collected at baseline and 2 weeks	To investigate the effect of BDJ on the patient with heart disease and depression.	1) Depression (SDS, HAMD)	Between baseline and 2 weeks, depressive symptoms improved 1) SDS: 68±11.344 vs. 67.63±11.462, p=.02 HAMD: 33.23±6.884 vs. 32.9±7.139, p=.004
Johansson and Hassmén (2013) [47]	OS	43	Sweden	59 (9.2)	43F	Practicing for 7 (4.2) years 21 were Qigong instructors and 25 were exercisers	Jichu form, Biyun qigong	Qigong takes 30 minutes Test before activity, 10 minutes into activity, 20 minutes into activity, and post activity	Whether Qigong increases positive affect	1) Affect (SCAS)	Significant changes after exercise: 1) from unpleasantness to pleasantness F(2.35, 105.84) = 53.41, np2 = .54, power = 1.0, p<.005 From deactivation to activation, F(2.2, 99.19) Z 46.18, hp2 Z .51,power Z 1.0, p<.0005 From Unpleasant-Deactivation to Pleasant-Activation F(2.18, 98.12) Z 29.38, hp2 Z .40, power Z 1.0, p<.0005 From Unpleasant-Activation to Pleasant-Deactivation; F(2.1, 94.66) Z 39.34, hp2 Z .47, power Z 1.0, p<.0005.
Overcash *et al.* (2013) [52]	OS	38	US	57.63 (11.3), 36-75	NR	NR	MQ	Pre- and post- design	Evaluate MQ has effect on fatigue, depression, and sleep in cancer patients and survivors	1) Fatigue (BFI) 2) Depression (CES-D) 3) Sleep (PSQI)	1) No significant changes in fatigue (t=2, p=0.06) 2) Significantly lower depressive symptoms (t=3.38, p<0.05) 3) No significant changes in sleep quality (t=0.85, p=0.41)
Kuan *et al.* (2012) [51]	OS	66	US	75.5 (12.4)	QG: 20M, 12F C: 15M, 19F	NR	Ho-gong	12 weeks, 5 days/ week, 35 min/day Quasi-experimental, pre-post test, nonequivalent control group design QG (n=32), control (n=34)	Test effects of Qigong exercise program on physiological and psychological health of wheelchair-bound older adults	1) Blood pressure 2) Distal skin temperature 3) Psychological symptoms (BSRS-5)	QG versus Control at week 12 1) lower BP; systolic: 103.6 vs. 128.8, p<.001; diastolic: 60.0 vs. 73.0, p<.001) 2) higher distal skin temperature: 36.1 vs. 33.8, p<.001 3) fewer psychological symptoms: 1.1 vs. 6.9, p<.001
Johansson and Hassmén (2008) [54]	OS	41	Sweden	56.7 (12.4)	6M, 35F	Practicing for average 6.9 (3.8) years 22 participants were instructors	Jichu Gong, Dong Gong (Biyun Qigong)	Randomized, cross-over design between practicing Qigong for 30 minutes or 60 minutes	Evaluate if length of Qigong exercise impacts mood and anxiety	1) Mood (POMS) 2) Anxiety (STAI)	30 minutes is sufficient to produce psychological benefits, and significant time effects were found for: 1) tension F(1, 40) = 50.57, ηp*2* =0.56, power = 1.0, p < 0.0005; depression F(1, 40) = 11.84, ηp*2* = 0.23, power = 0.92, p < 0.001; anger F(1, 40) = 8.54, ηp*2* = 0.18, power = 0.81, p < 0.006; vigor F(1, 40) = 29.74, ηp*2* = 0.43, power = 1.0, p < 0.0005; fatigue F(1, 40) = 9.91, ηp*2* = 0.20, power = 0.87, p < 0.003; confusion F(1, 40) = 31.57, ηp*2* = 0.44, power = 1.0, p < 0.0005 2) anxiety F(1, 40) = 78.01, ηp*2* = 0.66, power = 1.0, p < 0.0005;

SD=Standard deviation; QG=Qigong; OS=Observational study; US=United States; C=Control; NR=Not reported; BSRS-5=Brief Symptom Rating Scale-5 Items; BP=Blood pressure; EQT=External qi therapy; VAS=Visual Analogue Scale; ADL=Activities of Daily Living; FACT-G=Functional Assessment of Cancer Therapy-General; SF-MPQ=Short Form-McGill Pain Questionnaire; MFI-20=Multidimensional Fatigue inventory-20 items; PSQI=Pittsburg Sleep Quality Index; FIQ=Fibromyalgia Impact Questionnaire; BDI-II=Beck Depression Inventory-II; OT=observational trial; CFQ=Chaoyi fanhuan Qigong; PI-NRS=pain intensity numeral rating scale; SF-36=Short Form-36; STAI=State-Trait Anxiety Inventory; LSE=Lorig's self-efficacy scale; MPQ=McGill Pain Questionnaire; TC=Tai Chi; PSQ=Perceived Stress Questionnaire; CES-D=Center for Epidemiologic Studies Depression Scale; MQ=Medical Qigong; BFI=Brief Fatigue Inventory; POMS=Profile of Mood States; SCAS=Swedish Core Affect Scale; BDJ=Baduanjin; SDS=Self-Rated Depression Scale; HAMD=Hamilton Depression Scale

With regard to primary health outcomes, studies indicated mixed to positive results. Cohen *et al.* [45] found that EQT did not change tumor size among nine women with breast cancer in the U.S. and in China. In an open trial study, preliminary data by Liu *et al.* [49] showed significant improvement in the average level of blood glucose after a 12-week Qigong exercise program (-0.32 ± 0.26%, p<.01). With regard to musculoskeletal health outcomes, four studies with widely varying methods reported less pain among participants in a Qigong program [43,44,48,50]. Sakata *et al.* [46] found in two separate studies that Qigong significantly increased physical function among relatively health elderly Japanese women through both physiological and physical measurements and also found no significant difference between a Qigong/aerobic exercise regimen versus a Qigong-only exercise regimen. Overall, authors found that Qigong significantly improved depressive symptoms [51-53] and mood or affect [47,54]. Many authors examined psychological symptoms as secondary outcomes and found significant positive results in quality of life [45], depression [44,49,50], anxiety [43,44], and stress [49].

Health effects of Qigong in RCT studies by primary outcome of interest

Table 4 presents 48 RCT studies which focus on the effects of

Table 4. RCT of QG by Primary Outcome of Interest.

Author (Year)	**Population Characteristics**						**Methods**	**Intervention**	**Control**	**Outcomes of Interest**	**Instrument, if applicable**	**Critical Findings**
	#	**Country**	**Age, Mean (SD), Range**	**Sex**	**Previous QG Practice**	**Type of QG**						
Balance												
Liu *et al.* (2015) [64] #	95	China	QG: 67.1 (6.18) C: 66.63 (5.98)	QG: 9M, 38F C: 11M, 37F	None	BDJ	12 weeks, instruction/ practice with QG professional for two weeks (twice a week, 30-40 min each), then practice for 10 weeks (twice a week, 30-40 min each) Data collected at baseline and 12 weeks	QG and health education, N=47	Walking and health education, N=48	Study efficacy of BDJ on falls and balance of Chinese senior with chronic disease	1) Falls (MFES)	At 12 weeks, QG vs. C: 1) significant improvement of MFES scores among intervention group, 132.41±12.59 vs. 123.4±14.3, p<.05
Yang *et al.* (2007) [63]	49	U.S.	QG: 80.2 (9.02), 60-97 C: 80.9 (7.97), 67-94	QG: 5M, 28F C: 5M, 11F	NR	Tai Chi Chen style essential 48 form and QG meditation	6 months, 3 days a week, 60 min each session Data taken at baseline, 2 months, and 6 months	N=33	Wait-list, N=16	Evaluate changes in balance mechanism from Tai Chi Qigong program	1) Posture (SOT) 2) Stability (BOS, feet opening angle)	At 6 months, between QG and C: 1) Relative SOT vestibular ratios for the QG group were 47% greater than C, p<0.01 2) BoS measurements were 27% greater for the QG group than C, p<0.01. No differences were observed in feet opening angle. For QG group: 1) Normalized SOT vestibular ratio scores increased significantly by 34% above baseline at 2 months (p<0.01), and increased 6% between 2 months and 6 months (p>.05) 2) The normalized BoS score was 28% above baseline at T2 (P<0.01) and was maintained at 30% above baseline T6 (P<0.01).
Wenneberg *et al.* (2004) [65]	31	Sweden	33-80	17F, 19M	NR	NR	12 weeks (Weekend immersion, then 45–50 min once a week for 4 weeks, then every other week for 8 weeks with instructor) Data collected at baseline and 12 weeks	N=16	Wait-List, N=15	Effects of QG in patients with muscular dystrophy	1) Balance (BBS) 2) QoL (SF-36) 3) Coping (WCQ) 4) Depression (MADRS)	After 12 weeks, 1) no between group difference (p=.128) 2) significant difference between groups in general health perceptions after intervention (p=.027), none in other areas 3)significant between-group difference in positive reappraisal (p=.052), none in other areas 4) no significant differences between group or within group
Cognitive Function												
Oh *et al.* (2012) [66]	81	Australia	QG: 64.6 (12.3) C: 61.1 (11.0)	QG: 18F, 18M C: 20F, 20M	None	MQ (Daoyin)	10 weeks, two supervised 90-min sessions per week. Data collected at baseline and 10 weeks	N=37	Usual care, N=44	Evaluate effects of MQ on cognitive function, quality of life, and inflammation	1) Cognitive function (EORTC-CF and FACT-Cog) 2) QoL (FACT-G) 3) Inflammation (CRP)	At 10 weeks, QG compared to C: 1) improved cognitive function (EORTC), mean difference=7.78 (CI, -0.35 to 15.92), p=.01 Improved cognitive function (FACT-Cog), mean difference=4.70 (CI, -.30 to 9.71), p=.03 2) improved total QoL, mean difference 12.66 (CI, 8.00 to 17.32), p<.001 3) less inflammation, mean difference=-0.72 (CI, -1.37 to -0.07), p=.04

Diabetes												
Wei and Wu (2014) [67] #	60	China	54-73 QG: 63.9 (7.6) Walking: 64.8 (5.8) C: 65.3 (6.0)	38M 22F	None	BDJ	12 weeks, at least 5 days/ week, 3 times a day Data collected at baseline and 12 weeks	QG, N=20 Walking group, N=20	N=20	Observe the clinical efficacy of BDJ on type 2 diabetes patient's health states.	1) Diabetes related health status (CSSD-70) 2) QoL (SF-36)	At 12 weeks, QG versus control group: 1) significantly better diabetes-related health: 85.2±3.1 vs. 77.4±6.2, p<.05 2) significantly better quality of life Physical component: 88±10.9 vs, 82.4±7.4, p<.05 Mental component: 77.7±9.3 vs. 67±7.9, p<.05
Pain												
Cai *et al.* (2015) [57]#	60	China	QG: 50.8 (8.0) C: 49.9 (8.0)	QG: 16M, 14F C: 17M, 13F	None	BDJ	6 months, twice a day, 30 min each VAS data collected baseline and 1 month Subjective pain data collected at 1 month and 6 months	N=30	N=30	Explore the effect of BDJ exercise on the treatment and recovery of patients with spinal disease.	1) Pain (VAS) 2) subjective pain assessment	After 1 month, QG vs. control group: 1) 3.5± 1.1 vs. 4.0±1.3, p<.05 2) QG: 14 out of 30 participants reported 'fully recovery' another 7 participants reported have some improvement of their disease (70%). Control: 7 out of 30 participants reported 'fully recovery' another 6 participants reported have some improvement of their disease (43.3%). After 6 months: 2) QG: 20 out of 30 participants reported 'fully recovery' another 6 participants reported have some improvement of their disease (86%) Control: 11 out of 30 participants reported 'fully recovery' another 5 participants reported have some improvement of their disease (53%).
Wang *et al.* (2014) [59]	72	China	QG: 57.06 (8.96) C: 59.37 (6.51)	QG: 27F, 7M C: 24F, 11M	None within 6 months	BDJ	6 months (2 hours a day training for first two weeks, then 30 min collective exercise daily) Data collected at baseline, 3 months, and 6 months	N=36	Weekly 30 min telephone interview, N=36	Observe long-term effects of regular BDJ exercises on chronic neck pain	1) Pain (VAS, NPQ) 2) SF-36	At 6 months, differences between BDJ and control 1) less pain (VAS): 48.97 (18.54) vs. 57.71 (12.91), p=.026 less pain (NPQ): 20.17 (17.43) vs. 27.25 (9.59), p=.04 2) all NS except improved health transition, 28.03 vs. 41.77, p=.002
Lynch *et al.* (2012) [81]	100	Canada	QG: 52.81 (8.91) C: 52.13 (8.56)	QG: 3M, 50F C: 1M, 46F	None	CFQ	Training over 3 half-days followed by weekly review/ practice for 8 weeks Asked to practice 45-60 minutes per day Data collected at baseline, 6 months	N=53	Wait-list, N=47	Effects of CFQ on pain impact of fibromyalgia	1) Pain (PI-NRS) 2) Fibromyalgia impact (FIQ) 3) Sleep (PSQI)	QG group, change from baseline at 6 months 1) -1.30 (2.09), p=.003, 38.4% saw clinically meaningful improvements, p=.02 2) -15.19 (19.86), p=.003, 56.2% saw clinically meaningful improvements, p=.02 3) -2.86 (3.47), p=.008, 49.3% saw clinically meaningful improvements, p=.01

Wei *et al.* (2012) [115] #	62	China	QG: 29.39 (11.35), 15-58 C: 31.97 (12.15), 18-61	QG: 25M, 6F C: 26M, 5F	none	BDJ	3 months, twice a day, 15-20 minutes each session Data collected at baseline and 3 months	N31	N=31	Explore the effect of BDJ exercise on the inflammation index of AS patients	1) Pain (VAS) 2) Disease symptoms (ASAS 20)	At 3 months, differences between QG and control 1) Pain: 1.68±0.60 vs 2.48±0.69, p<.05 2) Physical Function:2.13±0.7 vs 3.25±0.91, p<.05 Thoracic activity□4.3±1.32 vs 3.66±1.07, p<.05 Schober back flex: 4.69±1.39 vs 3.79±1.26, p<.05
von Trott *et al.* (2009) [69]	117	Germany	76 (8), 55+	6M, 111F	NR	NR	3 months, 24 sessions total, 45 minutes each of Qigong or exercise therapy Data collected and baseline, 3 months, and 6 months	Qigong therapy, N=38 Exercise therapy, N=39	Waiting list control, N=32	Evaluate effectiveness of QG compared to exercise therapy and no treatment	1) Average neck pain (VAS) 2) Neck pain and disability (NPAD) 3) Depression (ADS)	at 3 months, NS difference between QG and C (95% CI) 1) -11.0 (-24.0 to 2.1), p=.10 2) -6.7 (-15.4 to 2.1), p=.14 3) -1.0 (-5.2 to 3.1), p=.62
Lansinger *et al.* (2007) [68]	122	Sweden	QG: 44.9 (12.3), 20-62 C: 42.8 (1.4), 21-65	Q: 44F, 16M C: 42F, 20M	NR	Biyun	3 months, 1-2 sessions a week, 1 hour (10-12 session total) Data collected at baseline, 3 months, 6 months after intervention, and 12 months after intervention	N=60	Exercise Therapy, n=62	Effect on long-term neck pain	1) Pain (diary, VAS, NDI)	1) No differences between groups for NP frequency, average NP in the most recent week, current NP, NP diary, and NDI. Patients improved immediately after intervention and at the 6- and 12-month follow-ups: above 50% for average NP in the most recent week, NP diary, NDI. and current NP (not for the time immediately after the intervention period).
Yang *et al.* (2005) [116]	40	Korea	QG: 72.58 (5.41) C: 72.67 (7.49)	QG: 13F, 6M C:19F, 2M	NR	EQT	4 weeks, twice a week QG: 20 minutes receiving Qi C: lay in similar position but without Qi Data collected at baseline, week 1, week 2, week 3, week 4, and week 6	N=19	Wait-list, N=21	Effects of EQT on pain and mood states	1) Pain (VAS) 2) Mood (POMS)	1) pain intensity decreased linearly over time in QG group but not in control group. Significant between-group time improvement in QG versus control [F(5,190)=13.8, p<.0001, HF-e=.95] 2) positive mood: significant between-group time improvement in QG versus control [F(5,190)=22/1, p<.0001]; gradually increased in QG but decreased in control Negative mood: significant between-group time improvement in QG versus control [F(5,190)=10.9, p<.0001, HF-e=.69].
Lee *et al.* (2001) [117]	40	Korea	QG: 73.05 (5.67) C: 72.20 (7.36)	QG: 14F, 6M C: 18F, 2M	NR	CSDB	2 weeks, qi therapy twice a week for 10 minutes (total 4 times) Performed by certified Qi therapist Data collected at pre-therapy, one week, and two weeks	N=20	N=20 Received general care in the same frequency	Assess effects of Qi therapy on reducing pain and enhancing mood states	1) Pain level (VAS) 2) Mood states (POMS)	Significant group x time interaction and better scores in QG group vs. control 1) Positive mood: F(2, 76)=21.29, p=.0001; QG vs. Control: 9.25±4.13 vs. 3.35±2.85, p<.005 Negative mood: F(2,76)=2.93, p=.06; QG vs. Control: 16.90±11.15 vs. 25.20±16.61, NS 2) Pain: F(2,76)=9.379, p<.0001) QG group has lower pain than control at 2 weeks (p<.005)
Physical function/fitness												

Wang *et al.* (2015) [118]#	26	China	60+ QG: 66.79 (4.76) C: 65.59 (3.59)	QG: 7M, 6F C: 3M, 10F	None	YJJ	12 weeks, QG practice 3 x a week, 1 hour each QG participants received 1 week of training prior to intervention Data collected at baseline and 12 weeks	N=13	N=13	Explore the effect of YJJ exercise on the prevention of Skeletal muscle weakness among senior adults	1) Physical function (Knee extensor / flexor peak torque, peak torque/body weight, and average power)	At 12 weeks, QG vs. control: 1) Statistically significant improvement of extensor peak torque 60°/s (96.35±31.18 vs. 76.23±24.39), extensor peak torque/body weight 60°/s (141.03±33.3 vs. 113.05±33.3), extensor average power 60°/s (49.1±12.68 vs. 40.1±11.69), and extensor average power 180°/s (49.63±16.65 vs. 36.75±13.8) among the intervention group, p<.05
Xiao and Zhuang (2015) [62]	100	China	QG: 68.17 (2.27) C: 66.52 (2.13)	QG: 68.75%M C: 70.83%M	None	BDJ	Four 45-min sessions/week, daily walking 30 min for 6 months Data collected at enrollment, discharge from rehab program and 6 months	N=50	Independent walking, N=50	Investigate effectiveness of BDJ on symptoms related to gait, functional mobility and sleep	1) Fatigue (UPDRS) 2) Functional mobility (BBS, 6MWT, TUG) 3) Sleep (PDSS) 4) Gait (Vicon 512 motion capture system, Freezing of Gait)	Across 6 months, comparing QG and control: 1) significant group × time interactions, with the QG showing a significant decrease in impairment measured by the UPDRS-III score (P = 0.038). 2) significant group × time interactions, with the QG showing greater improvements in the BBS (P = 0.037) and 6MW (P = 0.045), and greater decrease in the TUG (P = 0.028) 3) significant group x time interactions, with QG showing significant decrease in PDSS-2 total score (p=.045) 4) significant group × time interactions, with the QG showing a significant increase in the gait speed (p=.02)
Xiao and Zhuang (2015) [61]	126	China	71.1 (2.7), 65-85 QG: 72.2 (1.7) C: 70.9 (1.4)	QG: 82.1% M C: 93.6%M	None	LQG	6 months, four 45 minute sessions per week Data collected at baseline and 6 months	N=63	30 min walk daily, N=63	Investigate effectiveness of LQG in promoting physical and psychosocial function in individuals with COPD	1) Functional capacity (6MWT) 2) General health (SF-36)	1) Significant group by time interactions, with the QG group showing greater improvements on the 6MW (p=.04) over the 6-month study period than controls, and significant improvement for QG group between baseline and 6 months (301.0±10.9 vs. 321.5±15.5, p=.02) 2) Non-significant group by time interactions between QG and control over 6 months (p=.54), and significant improvement for QG group (43.9±3.5 vs. 51.8±5.6, p<.001)
Li *et al.* (2014) [119]	110	China	34.2 (14.6), 20-59 QG: 35.5 C: 32.9	QG: 19M, 39F C: 17M, 38F	NR	BDJ	16 weeks, QG 3 times or more each week, 30–60 minutes each time QG training 2 weeks prior to intervention	N=55	Wait-list N=55	Effects of BDJ on promoting physical fitness	1) Physical function (SR, ES, aerobic endurance)	1) SR: better physical fitness posttest-pretest scores, t=3.46, p=.001 ES: worse time but NS Aerobic endurance: improved but NS

Amano *et al.* (2013) [79]	21	US	TC: 64 (13) QG: 68 (7)	TC: 7M, 5F C: 7M, 2F	None	NR	16 weeks, 2x week, 60 mins/ session for both TC and QG	Tai Chi (Yang-style), N=12	QG meditation, N=9	Impact of Tai Chi vs. Qigong on gait and gait performance	1) Gait initiation (center-of-pressure measures) 2) Gait performance (cadence, gait velocity, step length, step duration, swing time, double lib support time, gait asymmetry) 3) Parkinsonian disabilities (UPDRS-III)	1) significantly shifted their COP more toward the initial swing limb after the 16-week period when compared to the TC group (p<0.01, η2=0.39). 2) no significant difference between groups in any variables (ps>.05) 3) no significant difference between groups (ps>.05)
Chan *et al.* (2011) [70]	206	HK	73, 55-88	TCQ: 69M, 1F Exercise: 61M, 8F C: 58M, 9F	None	13 form TCQ	3 months TCQ: Two 60-min sessions per week Exercise: pursed lip and diaphragmatic breathing Data collected at baseline and 3 months	TCQ, N=70 Exercise, N=69	Control, N=67	Evaluate the effectiveness of TCQ in enhancing respiratory functions and activity tolerance in individuals with COPD	1) Lung functions: Pre-broncholator spirometry 2) 6-min walk test 3) Dyspnoea and fatigue: Borg scale 4) Oxygen saturation	Results of RANCOVA demonstrated significant differences between baseline and 3 months, with TCQ group showing greatest improvements. 1) Forced volume capacity (FVC): 1.97±0.62 vs. 2.10±0.62 liters (p= .002), Forced expiratory volume in 1 s (FEV1): 0.89±0.38 vs. 0.96±0.39 liters (p< .001) 2) 6MWT: 297.91 ±68.53 vs. 33.074±61.86 meters (p< .001) 3) NS 4) NS
Maddali *et al.* (2011) [120]	30	Italy	G1: 56.56 (9.1) G2: 57.91 (13.50)	NR	NR	Dan tien, Zhang zhuang, Flying Pheonix	7 weeks, 2 sessions/ week for first three weeks, 1 session/week for weeks 4-7 (total 10 sessions) Cross-over design with 1 week interval Ressegaier Method session is 60 min QG is 45 min Data collected at baseline, week 7 (end intervention 1), week 15 (end intervention 2), week 27	Ressegaier Method, N=15 QG, N=15	None	Evaluate Ressegaier method and QG in fibromyalgia rehabilitation	1) disability (FIQ) 2) Pain (NRS) 3) Psychological outcomes (HADS)	Comparing baseline and week 7 for QG first group (G2) 1) less disability: 64.58±16.54 vs. 43.16±21.86, p<.05 2) less pain: 7.82±0.89 vs. 3.20±1.60, p<.001 3) less anxiety: 9.56±5.00 vs. 5.33±2.60, p<.001 Less depressive symptoms: 7.89±6.09 vs. 3.56±4.64, p<.001 Comparing baseline to week 27 (after both Ressegaier Method, QG, and follow up time) 1) G1 less disability: 66.05±13.50 vs. 44.72±16.67, p<.001 G2 less disability: 64.58±16.54 vs. 44.40±28.41, p<.05 2) G1 less pain: 7.58±0.89 vs. 3.51±0.65, p<.001 G2 less pain: 7.82±0.89 vs. 3.20±1.60, p<.001 3) G1 less anxiety: 8.91±2.51 vs. 5.64±3.32, p<.001 G1 less depressive symptoms: 9.45±2.88 vs. 6.64±3.01, p<.001 G2 less anxiety: 9.56±5.00 vs. 5.33±2.29, p<.001 G2 less depressive symptoms: 7.89±6.09 vs. 3.78±4.52, p<.001

Chen *et al.* (2008) [55]	112	US	H1: 63.9 (9.7) H2: 58.8 (7.0) C: 62.9 (9.2)	H1: 14M, 31F H2: 3M, 9F C: 13M, 36F	Experience with some CAM therapies, none with EQT	EQT	3 weeks, 5-6 sessions. Each healer had a different technique H1: 4-7 minutes H2: 5-10 minutes C: Chinese man without experience mimicked EQT movements Data collected at baseline, 3 weeks, and 3 months	H1: N=45 H2: n=12	Sham treatment, N=52	Effects of EQT on osteoarthritis pain and functional	1) Osteoarthritis pain and function (WOMAC)	1) No difference between sham and healer 1 Difference between sham group and healer 2 for pain (p<.01), functionality (<.01) and total WOMAC scores (p<.01) at 3 month follow up Belief in CAM therapy was a significant covariate in predicting treatment outcome immediately after treatment (p<.05)
Pippa *et al.* (2007) [121]	43	Italy	68 (8)	30M, 13F	NR	NR	16 weeks of intervention QG: two 90-minute training sessions per week, 32 total Follow-up 16 weeks after intervention	N=22	Wait-list, n=21	Effects of QG on functional capacity	1) Physical function (6MWT)	1) Significant improvement in QG group versus control group at two time points: pre-training versus post-training (p<.001) and pre-training and follow-up (p=.008)
Burini *et al.* (2006) [122]	26	Italy	65.2 (6.5)	9M, 17F	NR	NR	Crossover design (total 22 weeks): 7 weeks, 20 sessions of 50 min, 3 days weekly 8 weeks of no treatment 7 weeks, 20 sessions of 50 min, 3 days weekly of remaining treatment Data collected at baseline, after first intervention, after no treatment, after second treatment	QG, N=15 Aerobic Training sessions, N=11	None	Effects of QG versus aerobic training in subjects with Parkinson's	1) Impairment from Parkinson's (UPDRS) 2) Depression (BDS) 3) Physical function (6MWT)	1-2) All changes after QG training were not significant, p>0.05 3) Group x time differences significant: F=5.4, p=.002 Aerobic training group showed significant improvements t=-2.7, p=.005, while QG group changes were not significant
Schmitz□Hübsch *et al.* (2006) [58]	56	Germany	QG: 64 (8) C: 63 (8)	QG: 24M, 8F C: 19M, 5F	None	"Frolic of the crane", sitting BDJ	24 weeks (Two courses of 8 weeks with an 8-week pause in between), 90 minutes each, 16 visits total, 1X/week Encouraged to practice at home Data collected at baseline, 3 months, 6 months, and 12 months	N=32	N=24	Evaluate effects of QG on motor symptoms of Parkinson's Disease	1) Motor symptoms (UPDRS-III) 2) Quality of life (PDQ-39) 3) Depression (MADRS)	1) The proportion of patients who improved in UPDRS- III, was significantly greater in QG group at 3 months (P=0.0080), while at 6 months (P =0.0503) and 12 months (P= 0.635) was not significant. 2) no significant between-group differences, data not reported 3) The prevalence of mild or moderate depression was 48% in the QG group and 41% in the control group at baseline compared with 33% in both groups at 6 months Proportions of patients using antidepressants were 19% (QG) and 24% (control) at baseline but shifted to 16% (QG) and 32% (control) at 12-month follow-up

Stenlund *et al.* (2005) [123]	95	Sweden	QG: 77 (3), 73-92 C: 78 (3), 73-84	66M, 29F	NR	TC and medicinal QG	12 weeks, 60 min QG and 120 min of discussion on various themes, meeting weekly	N=48	Usual Care (n=47)	Effect of QG on physical ability on subjects with coronary artery disease	1) Physical function (Perceived activity level, tandem standing, right/left one-leg stance, right/left co-ordination, climb boxes	Significant improvement for QG compared to Control group in self-estimated level of physical activity (*P* = 0.011), and their performance in the one-leg stance test for the right leg (*P* = 0.029), co-ordination (*P* = 0.021) and the box-climbing test for right leg (*P*= 0.035)
Astin *et al.* (2003) [124]	128	US	18-70 47.7 (10.6)	QG: 1M, 63F C: 64F	NR	Mindfulness meditation with QG movement	8 weeks, 1x/week, 150 minutes (90 min mindfulness, 60 min Qigong) Data collected at baseline, 8 weeks, 14 weeks, and 24 weeks	N=64	Education and support group, N=64	Test benefits of a mind-body intervention for individuals with fibromyalgia	1) Fibromyalgia impact (FIQ) 2) Pain (SF-36) 3) Depression (BDI)	No significant differences between groups at 24 weeks Baseline vs. 24 weeks, QG improvement: 1) 57.8±10.8 vs. 46.4±19.5, p<.01 2) 32.3±14.4 vs. 41.6±22.2, p<.05 3) 16.7±7.4 vs. 12.3±7.6, p<.001
Psychological												
Hsieh *et al.* (2015) [77]	66	Taiwan	QG: 81.21 (6.24) C: 83.42 (7.87)	QG: 13M, 20F C: 18M, 15F	NR	LQG	4 weeks, twice a week, 60 min led by LQG practitioner Data collected at baseline week 4	N=33	N=33	Determine psychological and physiological effects of LQG on elderly in an institutionalized setting	1) Memory (MMSE) 2) Mood (Faces Scale) 3) Depression (GDS) 4) Cortisol levels	Between baseline and week 4, QG showed: 1) improved Mini-Mental State Examination scores (Z = −2.28; p<.05), NS difference with control (Z=-.27, p=.79) 2) improved mood states (Z = −4.47; p<.001), significant difference with control (Z=5.87, p<.001) 3) decreased depression scores (Z = 3.79; p<.001), significant difference with control (Z=3.27, p=.001) 4) NS change in cortisol (Z=-.143, p=.15), significant difference with control (Z=3.02, p=.003)
Chen *et al.* (2013) [76]	96	China	QG: 45.3 (6.3), 29-58 C: 44.7 (9.7), 35-62	96F	None	Guolin (walking Qigong)	5-6 weeks, five 40-minute Qigong classes Data collected at baseline, middle of radiotherapy, last week of radiotherapy, 1 month post radiotherapy, and 3 months post radiotherapy	N=49	Wait-list control, N=47	Examine QG effects on QoL on women with breast cancer during radiotherapy	1) Depression (CES-D) 2) Fatigue (BFI) 3) Sleep (PSQI) 4) QoL (FACT-G) 5) Cortisol	1) Significant group differences in depression over time (F[3,281] = 2.62; P =.05). QG depression score at baseline vs. 3 months post-radiotherapy: 13.1±8.9 vs. 9.6±6.6 Control depression score at baseline vs. 3 months post-radiotherapy: 12.2±9.2 vs. 11.2±9.8 2-5) No significant differences between QG and Control groups.
Tsang *et al.* (2013) [125]	116	HK	QG: 83.3 (6.3) C: 84.9 (6.0)	QG: 14M, 47F C: 15M, 40F	NR	Yan Chai Yi Jin Ten-Section Brocades	12 weeks, two 60 minute sessions per week Data collected at baseline, week 6, 12 weeks, and 20 weeks	N=61	Newspaper reading group, n=55	Effectiveness of QG for improving psychosocial, cognitive, physical, and physiological functioning in frail older adults	1) Psychological (GDS and PBQ) 2) Cognitive function (LOTCA-G) 3) Physical function (Handgrip strength) 4) Physiological functioning (HR, BP)	Group x time interaction showing effectiveness of QG: 1) NS interaction on depression [F(2,228)=1.16, p=.32] Significant interaction on overall health status [F(1,57)=15.26, p=.0001] 2) only significant interaction effect for thinking operations [F(2, 228)=4.05, p=.02] 3) NS interaction in handgrip strength [left: p=.70, right: p=.58] 4) significant effects on resting heart rate [F(2,228)=3.14, p=.045], but not on SBP (p=.22) or DBP (p=.88) After intervention compared to baseline, QG group showed 1) Significant reduction of depressive symptoms [F=11.68, p<.025]

Tsang *et al.* (2013) [78]	37	HK	QG: 80 (7) C: 81 (9)	QG: 5M, 16F C: 7M, 10F	NR	BDJ	12 weeks, three 45 min sessions per week Data collected at baseline, week 6, week 12, week 16, week 24	N=21	Newspapers reading, N=17	Examine psychological, physical and neurophysiological effects of a QG exercise program on depressed elders	1) Depression (GDS) 2) Physical (grip strength) 3) Neurophysiological (cortisol)	1) significant group x time effects on GDS [F(2,35)=5.72; p=.007] QG had higher response and remission rates than the comparison group concerning depression (43% vs. 6%, 24% vs. 6%, respectively; ps<.01) 2) QG: improvement for right hand by 18%, p=.034. Improvement for left hand by 26%, p=.164 3) QG: Non-significant decreasing trend of cortisol level by 18.5%
Chow *et al.* (2012) [126]	65	HK	21-64 QG:43.79 (10.37) C: 44.66 (11.86)	QG: 12M, 22F C: 11M, 23F	None	Chan Mi gong	12 weeks, Weekly 90 min practice with instructor for first 8 weeks, then 4 weeks of home practice Data collected in weeks 1, 4, 8, and 12	N=34	Wait-list, N=31	Investigate whether QG helps to reduce stress and anxiety	1) Mood States (DASS-21) 2) QoL (ChQOL)	Between group comparisons between week 1 and week 12, QG vs. Control: 1) significant differences in overall psychological wellbeing (F[1,63]=4.26, p.043, n^2=.063) 2) significant differences in QoL (F[1,63]=6.04, p=.017, n^2=.088) Between week 1 and week 12, QG experienced: 1) significant decrease in stress (F[1,63]=5.77, p=.019) and anxiety (F[1,63]=4.72, p=.034) 2) significant increase in overall QoL (F[1,63]=6.04, p=.017)
Chan *et al.* (2011) [75]	40	HK	25-64 QG: 49.65 (7.27) C: 48.92 (8.11)	QG: 7M, 13F C: 7M, 13F	NR	DMBI	4 weeks, weekly 90-min sessions Data collected at baseline and 4 weeks	N=20	Group CBT, N=20	Effectiveness of a short-term mind-body intervention program on improving depressive mood	1) Depression (BDI-II)	1) QG: significant reduction in depressive mood after treatment [baseline = 14, SD = 10.42; post-test =6.30, SD = 6.67; t(19) = 3.82, p=.001; effect size (Cohen's *d*) = 0.85] Extent of reduction for QG vs. CBT was significantly greater (p<.05)
Johansson *et al.* (2011) [56]	59	Sweden	50.8 (12.9)	51 F, 8M	Average 4.8±3.1 years of practice	Jichu Gong	30-min practice Control: listened to a 30 min lecture Data collected at baseline and after 30 min exercise	N=28	Lecture on Chinese medicine, N=31	Investigate acute psychological effects of QG among regular QG exercisers	1) Depression (POMS) 2) Anxiety (STAI) 3) Anger (POMS) 4) Fatigue (POMS)	Time x group interactions: 1) Depression: F(1, 57) = 10.61, h^2 =.16, power=.89, p<.002 2) Anxiety: F(1, 57) = 7.67, h^2 =.12, power= .78, p < .008 3) Anger: F(1, 57) = 8.41, h^2 =.13, power=.81, p <.0005 4) Fatigue: F(1, 57)=18.06, h^2 = .24, power= .99, p< .0005 Changes in QG group after exercise: 1) lower depression, F(1, 57)=17.10, h^2 = .23, power= .98, p< .0005 2) lower anxiety, F(1, 57)=29.42, h^2 =.34, power=1.0, p<.0005 3) no significant changes 4) lower fatigue, F(1, 57)=11.21, h^2 = .16, power= .91, p<.001

Stenlund *et al.* (2009) [127]	82	Sweden	25-65 QG: 43.8 (9.7) C: 44.7 (8.6)	QG: 7M, 34F C: 7M, 34F	NR	NR	12 weeks, twice a week, 1 hour group practice plus home practice Data collected at baseline and 12 weeks	N=41	Usual care, N=41	Evaluate efficacy of QG in rehabilitation for patients with burnout	1) Burnout (SMBQ)	1) At 12 weeks, NS difference between groups, p=.70 QG: significantly lower median score after program, 5.8 (5.0-6.0) vs. 5.4 (4.4-5.8), p<.001 C: significantly lower median score after program, 5.8 (4.8-6.2) vs. 5.0 (4.5-5.7), p<.001
Griffith *et al.* (2008) [128]	37	US	QG: 52 (9) C: 50 (10)	QG: 12F, 4M C: 17F, 5M	None	BDJ	6 weeks, twice a week, 1 hour class Asked to practice for 30 min on non-class days Data collected at baseline and 6 weeks	N=16	Wait-list, control, N=21	Investigate effectiveness of QG in reducing stress in hospital staff	1) Stress (PSS) 2) QoL (SF-36) 3) Pain (VAS)	1) Significant difference in reduction of perceived stress over time between QG and Control (t=-.2458, p=.02) QG: decreased mean=-4.5±6.6 2) Significant difference in social functioning score over time between QG and control (t=2.035, p=.05) 3) NS difference in reduction of pain over time between QG and Control (t=-1.097, p=.28)
Haak and Scott (2008) [129]	57	Sweden	27-73 QG: 54.0 (9.4) C: 53.4 (8.0)	57F	85% have used some form of CAM	Lotus method (He Hua QG) EQT	7 weeks, 9 group session (Total 11.5 hours) Encouraged to practice twice a day for 20 minutes Received EQT twice during intervention Data collected at baseline, 7 weeks, and 4 months	N=29	Wait-list, N=28 At 4 month follow up, control had received intervention	Evaluate the effects of QG on pain, quality of sleep, psychological health, work status, and use of medication	1) Anxiety (STAI) 2) Depression (BDI) 3) QoL (WHOQOL-BREF) 4) Pain (VNS)	Group x time differences between intervention and control at baseline to 7 weeks 1) anxiety: F(1,55)=5.81, p<.05 2) depression: F(1,55)=6.44, p<.01 3) quality of life: F(1,55)=4.03, p<.05 4)intensity of pain: F(1,55)=5.34, p<.05 Time interaction of combined (N=57) group changes after intervention (baseline, 7 weeks, 4 months) 1) decreased anxiety: F time=4.90, p<.01 2) decreased depressive symptoms: F time=6.80, p<.01 3) increased quality of life: F time=6.24, p<.01 4) decreased intensity of pain: F time=7.88, p<.001
Tsang *et al.* (2006) [130]	82	HK	QG: 82.11 (7.19) C: 82.74 (6.83)	QG: 10M, 28F C: 6M, 28F	NR	BDJ	16 weeks, 3 days a week, 30-45 min each Data collected at baseline, 8 weeks, and 16 weeks	N=48	Newspaper Reading group of similar intensity, N=34	Understand the psycho-social effects of QG on elderly persons with depression	1) Depression (GDS) 2) Self-efficacy (CGSS)	Group x time interaction among the two groups at five different time points: 1) Depression [F(4, 77)=2.619, p=0.041], 2) Self-efficacy [F(4, 77)=11.693, p<0.001] After practicing QG: 1) improvement in depression, significance not reported 2) improvement in self-efficacy, significance not reported

Tsang *et al.* (2003) [131]	50	HK	G: 72.9 (9.5) C: 76.3 (8.4)	QG: 9M, 15F C: 17M, 9F	NR	BDJ	12 weeks, 2 days/week, 60 min each Data collected at baseline, midway, and post-program	N=24	Basic Rehabilitation activities, N=26	Assess if BDJ improves bio-psychosocial health of participants	1) Depression (GDS) 2) Perceived benefit (PBQ)	1) repeated measures ANOVA of two groups is not significant [F(2, 39)=2.032, p=.145] 2) QG group has perceived improvement in physical health [19.36±2.79, t(21)=7.34, p<.001], overall ADL [14.75±2.12, t(7)=3.67, p=.008], psychological health [26.73±2.91, t(21)=9.22, p<.001], social relationship [11.05±1.94, t(21)=4.95, p<.001], and health in general [7.50±1.06, t(21)=6.65, p<.001]
Quality of Life											
Oh *et al.* (2014) [72]	27	AU	QG: 56.9 (12.1) C: 57.8 (10.8)	27F	None	MQ	10 weeks, once a week, 60 min group supervised class Encouraged to practice at home for 30 min each day Data collected at baseline, week 5, and week 10	N=14	Meditation, N=13	Examine the feasibility, safety, and effects of MQ in improving QoL in women with metastatic breast cancer	1) QoL (FACT-B) 2) Fatigue (FACT-F) 3) Perceived stress (PSS) 4) Neuropathic symptoms (FACT/ GOG-NTX)	At 10 weeks: 1) No significant differences between groups (p=0.84) 2) No significant differences between groups (p=0.71) 3) No significant differences between groups (p=0.52) 4) Significant group difference (0=0.014), QG improved while control deteriorated
Lin *et al.* (2012) [132]#	60	China	50-85 QG: 66.47 (8.26) C: 64.9 (8.87)	QG: 24M, 6F C: 22M, 8F	None	BDJ	23 weeks Data collected at baseline, mid-intervention, and 23 weeks	N=30	N=30	Explore the effect of BDJ exercise on quality of life of patients after Coronary artery bypass grafting	1) QoL (QOLS) 2) Functional status (SAQ)	QG compared to Control group 1) improvement of QoL, p<.05 2) improvement of functional status, p<.05
Oh *et al.* (2010) [71]	162	Australia	31-86 QG: 60.1 (11.7) C: 59.9 (11.3)	QG: 48F, 31M C: 45F, 38M	None	MQ	10 weeks, two supervised 90-min sessions per week. Participants encouraged practice at home every day for at least 39 min Data collected	N=79	Usual care, N=83	Evaluate use of MQ compared with usual care to improve quality of life of cancer patients	1) QoL (FACT-G) 2) Fatigue (FACT-F) 3) Mood (POMS) 4) Inflammation (CRP)	At 10 weeks, QG compared to C (controlling for gender, age, status of cancer treatment, week 0 baseline scores, and intervention status) 1) improved overall QoL, mean difference=9.00 (CI, 5.62 to 12.36), p<.001 2) improved fatigue score, mean difference=5.70 (CI, 3.32 to 8.09), p<.001 3) improved total mood status, mean difference=-10.64 (CI, -19.81 to -1.47), p=.02 4) less inflammation, mean difference=-23.17 (CI, -37.08 to -9.26), p=.04
Oh *et al.* (2008) [73]	30	Australia	54 (9), 35-75	QG: 3M, 12F C: 3M, 12F	None	MQ	8 weeks, once or twice a week, 90 mn class (15 min discussion, 30 min stretching and movement, 15 min seated movement, 30 min breathing) Recommended practice at home very day for at least 1 hour Data collected at baseline and week 8	N=15	Usual care, N=15	Examine impact of MQ for improving QoL, symptoms, side effects, and longevity	1) QoL (ERORTC QLQ-C 30) 2) Symptoms (ERORTC QLQ-C 30) 3) inflammation (CRP)	No significant differences between groups due to small sample size For QG group changes from baseline to week 8 1) improvement in QoL (10.4, p=.005) 2) No significant changes in fatigue, nausea, pain, dyspnea, insomnia, appetite, constipation, or diarrhea ps>.05 3) NS increase in CRP score +1.7

Wang *et al.* (2007) [60] #	200	China	Male: 61-65 QG: 63 (2.7) C: 62.4 (2.6) Female: 56-60 QG: 57.8 (2.6) C: 56.9 (3.0)	QG: 60M, 60F C: 40M, 40F	None	BDJ	6 months, 1 hour every day Data collected at baseline and 6 months	N=120	N=80	explore the effect of BDJ exercise on quality of life of senior people.	1) QoL (SF-36)	Outcome were reported based on gender After 6 months, QG vs. control groups: 1) Male: SF-36 total: 78.4±14 vs. 67.7±10, p<.05 Female: SF-36 total: 81.9±13 vs. 76.1±12, p<.05
Sleep												
Liao *et al.* (2015) [133]	131	China	QG: 31.1 (10.46) C: 31.6 (10.74)	QG: 10M, 52F C: 23M, 44F	NR	BDJ	6 weeks, exercised 30 minutes 2x a day Data collected at baseline, week 4, week 6, week 12, and week 18	N=64	N=67	Observe effect of BDJ on fatigue	1) Fatigue (FSAS)	From baseline to end of week 18 1) NS group x time interaction, p=.66 Significant difference over time: F=34.855, p<.001 Significant difference between groups: F=27.375, p<.001 QG improved between baseline and 18th week: 41.50±12.36 vs. 12.28±10.46
Larkey *et al.* (2014) [134]	87	US	40-75 QG: 57.7 (8.94) C: 59.8 (8.93)	87F	None	QG/ TCE	12 weeks, 60 min sessions meeting 2x a week for the first 2 weeks and then once a week for the remainder Asked to practice at home at least 30 min a day, 5 days per week Data collected at baseline, post-intervention, 3 months later	N=45	Sham Qigong N=42	Compare QG/ TCE with SQG on fatigue and other symptoms among breast cancer survivors	1) Fatigue (FSI) 2) Depression (BDI) 3) Sleep (PSQI)	1) Fatigue difference between intervention group and time (p=0.0116). The decrease in the FSI was significantly greater for the QG/TCE intervention at both the post-intervention (p=0.005) and 3-month follow-up (p=0.024) 2) No statistically significant interactions between groups, p=.94; showed significant decreases across time for QG/TCE and SQG (p<.001) 3) No statistically significant interactions between groups, p=.27; showed significant decreases across time for QG/TCE and SQG (p<.05)
Li and Wang (2014) [135] #	40	China	QG: 53.60, 41-69 C: 51.4 (9.2), 39-70	QG: 11M, 9F C: 8M, 12F	none	BDJ	4 weeks, practice once a day, 30 min each Data collected at baseline and 4 weeks	N=20	N=20	Explore the effect of BDJ exercise on insomnia among type 2 diabetes	1) Sleep (PSQI)	1) After 1 month, NS difference between QG and control groups, however there is a trend of improvement from baseline to 1 month for QG group (8.43±4.48 vs. 9.03±4.61)
Chan *et al.* (2012) [136]	50	HK	28-62 QG: 47.06 (9.54) CBT: 47.39 (6.63) WL: 45.44 (8.25)	QG: 2M, 15F CBT: 5M, 13F C: 4M, 12F	NR	DMBI	10 weeks, one weekly 90 min sessions for either DMBI or CBT Data collected at baseline and 10 weeks	Two groups: 1) QG, N=17 2) CBT, N=18	Wait-list, N=16	Compare the effect of DMBI vs. CBT on improving sleep problems of patients with depression	1) sleep items (HRSD) 2) Total sleep time (hours) 3) Sleep onset latency (min) 4) Wake time after sleep onset (min)	For QG group, mean difference between baseline and 10 weeks: 1) -1.50 (1.51), p<.01 2) 0.79 (1.64), p=.03 3) -9.81 (21.25), p=.04 4) -12.10 (26.34), p=.09 For CBT and Control, no significant differences in pre- and post- treatment testing of sleep
Chen *et al.* (2012) [137]	56	Taiwan	71.75 (8.13) QG: 70.48 (7.90) C: 72.96 (8.30)	QG: 17F, 10M C: 19F, 9M	None within 6 months	BDJ	12 weeks, 30-min home-based exercise, thrice a week. Data collected at baseline, week 4, week 8, and week 12	N=28	N=28	Explore effectiveness of BDJ on sleep quality in Taiwanese elderly	1) Sleep quality (PSQI)	1) QG: significant improvement in their overall sleep quality (F = 26.04, p<.001) After 12 weeks, mean scores of sleep quality were significantly improved in the exercise group over the control group in overall sleep quality (β = -5.10, p<.001)

Qigong on balance (n=3), cognitive function (n=1), diabetes (n=1), pain (n=8), physical function/fitness (n=13), psychological (n=12), quality of life (n=5), and sleep (n=5). Twenty-six articles examined the effects of Qigong among individuals of East Asian descent. Regarding type of Qigong, Baduanjin (BDJ) was the most common and was cited in 17 studies. Four articles, one in conjunction with internal Qigong, examined the effects of EQT. Out of these articles, Chen *et al.* [55] found that the individual healer significantly influences the health outcome from EQT, which was tested through using randomized groups with two healers with individualized styles and a control group. Seven articles did not specify the type of Qigong practiced in the study.

Study design widely varied, as active intervention time period ranged from 30 minutes [56] to 6 months [57-63]. Twenty-nine studies used wait-list or usual care controls. Some studies tested multiple forms of intervention; eighteen studies used some form of active control, and six studies used more than two randomized groups. Previous experience with Qigong or other mind-body therapies was not consistently reported, and only one article reported the measurement and association of belief in CAM as an effective treatment and the tested health outcome [55].

Regarding balance, Liu *et al.* [64] and Yang *et al.* [63] found that Qigong improved balance among older adults, while Wenneberg *et al.* [65] found no significant group differences among adults of all ages with muscular dystrophy. Oh *et al.* [66] found that the medical Qigong intervention significantly improved cognitive function as measured by two instruments (EORTC-CF and FACT-Cog). Regarding diabetes-related health, Wei and Wu [67] reported significantly better status among the Qigong intervention group versus the control group. Six out of eight studies examining pain levels after a Qigong intervention found a significant decrease in pain. Lansinger *et al.* [68] found no difference between a Qigong group and an exercise therapy control, and both groups showed improvement regarding pain. von Trott *et al.* [69] similarly found no significant difference in pain level between three randomized groups: Qigong, exercise therapy, and wait-list control. All these studies used a visual analogue scale to examine pain severity.

Improvements in physical function were found in eleven out of thirteen studies, and the measurements and types of Qigong practiced in these thirteen studies greatly varied. Notably, a few studies found significant improvements in Qigong groups versus other forms of exercise. Chan *et al.* [70] found that a Tai Chi Qigong group showed the greatest significant improvements in lung function and the 6-Minute Walk Test compared to both an exercise group and a control group. Xiao and Zhuang [62] found in a comparison of BDJ and walking exercise, there was a significant group by time interaction regarding functioning mobility, with greater improvements in the BDJ group.

Regarding psychological outcomes, twelve out of twelve studies found that psychological symptoms, ranging from mood to depression to burnout, significantly decreased after a Qigong intervention. For quality of life, three out of five studies showed significant improvement among Qigong group participants. After controlling for gender, age, status of cancer treatment, baseline scores, and intervention status, Oh *et al.* [71] found that the Qigong group had a greatly improved quality of life compared to a usual care group. On the other hand, Oh *et al.* [72] found no significant differences in quality of life between a medical Qigong group and a meditation group. Both studies which did not find significant differences had relatively smaller sample sizes of 30 individuals or less [72,73]. Lastly, four out of five studies showed significant improvement of sleep or fatigue among Qigong group participants, and all studies showed at least a trend of improvement after a Qigong intervention.

Discussion

Our global literature review regarding Qigong practice among older adults shows that there is significant and expanding evidence concerning the efficacy of Qigong at improving health outcomes. However, there is limited knowledge about the prevalence and characteristics of individuals who practice Qigong both in China and worldwide. Research has instead focused on clinical trials to determine the health outcomes of a Qigong intervention. Trial research has found that Qigong practice may improve certain conditions, especially those that are chronic like musculoskeletal disorders and psychological distress. Type of Qigong and length of practice may influence results. However, many limitations exist, especially concerning study design.

Prevalence and practitioner characteristics

From our findings, there is very little information about the prevalence of Qigong practice by country and internationally, as well as limited information about practitioner characteristics. In the U.S., data are mostly drawn from the National Health Interview Survey, and most research articles include estimates for an aggregated adult category and/or aggregated mind-body therapy category. However, based on these figures, Qigong is not a popular form of exercise for U.S. adults, with most estimates under 0.5%. The only non-U.S. sample regarding prevalence is from Singapore, where 3.5% of older adults practice Qigong. Regarding Qigong practitioner characteristics, there is some evidence that Qigong practitioners have better health [8,40,41,74] and lower medical costs [10] than non-practitioners, though it is difficult to compare across samples and not all articles included comparison groups for analysis. It is also unknown if these figures are representative of Qigong practitioners and therefore, generalizable.

Notably, data about Qigong prevalence and practitioner characteristics in China is missing. A few authors have estimated that there are 65 or 70 million Qigong practitioners in China [5,6], but how they ascertained these figures is unknown. Various Chinese political movements have influenced the practice and research of Qigong due to its possible association with religious or "subversive" activities [4], which has impacted the kind of research conducted on Qigong from China. To understand the relevance of Qigong globally, research should work to provide estimates on the number of practitioners, with special attention paid to the type of Qigong and other demographic and health related data. Population and longitudinal studies are needed to understand the practice of Qigong among community-dwelling older adults, why they practice, and the physiological, physical, and psychological health effects of this practice.

Research trials

Given the wide variety of study designs, it is beyond the ability of this review paper to confirm the findings of the research trials; however, there are a few emerging themes regarding type of Qigong, overall health improvements due to Qigong practice, comparisons to other forms of intervention or usual care, and practice length.

Type of Qigong

From the available data, it appears that there are differences in health outcome depending on the type of Qigong practiced, though it is difficult to make any concrete conclusions due to variability in study design. Regarding EQT, researchers mostly found non-significant findings, possibly due to small sample size. However, Chen *et al.* [55] found that the individual healer and their technique impacted the effect of EQT on pain, as there was no difference between one of the healers and the sham treatment but lessened pain from the other healer. Regarding internal Qigong, our findings indicated that BDJ is the most common form for testing Qigong health outcomes, used in 18 out of the 52 trial studies which reported type of Qigong. However, our review was unable to find sufficient evidence that one form of internal Qigong is more effective than another for any specific condition. For example, Laughing Qigong, Guolin Qigong, Dejian Mind-Body Qigong, and Baduanjin were all found to decrease depressive symptoms over time [75-78].

Even in studies where results are not significant, it is unclear if it is an issue in study design or the ineffectiveness of the type of Qigong. For example, Wenneberg *et al.* [65] did not find any group differences of patients with muscular dystrophy between an intervention and wait-list control group. However, the authors did not report the type of Qigong used, and it is unknown if another form of Qigong would have had significantly different effects on health outcomes. According to Kemp ([2], there are many forms of Qigong that can be used for a variety of conditions and physical function levels. Amano *et al.* [79] did not find any significant changes in physical function when comparing outcomes of a Qigong meditation group and a Tai Chi group, but the sample size was only 21 individuals. To our knowledge, there are few RCTs which examine the effectiveness of one form of Qigong to another, and further research is needed to more rigorously examine the best form of Qigong for a specific health outcome.

Health outcomes

Qigong interventions have been shown to significantly improve certain health outcomes, especially in regard to pain and psychological outcomes. Most studies which examined pain used a visual analogue scale, which is thought to be a highly reliable measurement [80]. Lynch *et al.* [81] found clinically significant improvements among individuals with fibromyalgia in pain between baseline and a six-month follow up in a Chaoyi Fanhuan Qigong intervention. According to the authors, Chaoyi Fanhuan Qigong is a gentle form that does not involve aerobic activities, but rather focuses on mindfulness, which some research has shown to be effective in reducing pain [82]. Regarding psychological outcomes, Chen *et al.* [76] found that Guolin Walking Qigong reduces depressive symptoms over time, and similar results were found by Tsang *et al.* [78] with a BDJ intervention. Both these types of Qigong emphasize the active and physical components of Qigong.

From this review, we can see that both mindfulness and physical components of Qigong seem to help promote positive health outcomes. This is, perhaps, unsurprising, as mindfulness meditation [82] and regular physical exercise [83] have been shown to improve health in older adults. However, Qigong should not be conflated with either meditation and regular physical exercise or necessarily the sum of both parts, as Qigong involves distinct beliefs about energy meridians and blockages [2], which is not present in the other activities. Instead, future research should examine the unique quality of Qigong, including but not limited to, its cultural specificity and contextual belief system and whether this influences the magnitude of the health outcome.

Intervention and control design

Further, Qigong research has found some mixed preliminary findings regarding of the efficacy of Qigong compared to other forms of intervention or usual care. In comparing different kinds of exercise, Qigong was found to be an effective practice to improve respiratory and physical function. Sakata *et al.* [2] examined two Qigong groups, where one of the groups additionally practiced some aerobic exercise. Given that there was no significant difference between groups in regard to physical function, the authors concluded that Qigong practice alone is an effective way to improve physical function. Chan *et al.* [75] and Xiao and Zhuang (2015) [61] both compared the physical function abilities of a Qigong practice group and a walking exercise group and found that the Qigong group showed significant and greater improvements in a six-minute walk test. In contrast, Oh *et al.* [72] found that when comparing the outcomes of Qigong exercise and exercise, there were no significant differences in quality of life outcomes, which may speak to how essential the meditative aspects of Qigong are in its practice. Notably, one study found few significant differences between Tai Chi and Qigong meditation in terms of gait performance [79], which indicates that there may not be large differences between these two mind-body forms. Among individuals with depressive symptoms, a study of 40 community-dwelling adults in Hong Kong by Chan *et al.* [75] found that Qigong was much more effective at reducing depressive mood than cognitive-behavioral therapy, a common psychotherapy technique, after only one month. The authors point to the cultural acceptability of Qigong among Chinese participants, while cognitive behavioral therapy is often used in western settings and may be less acceptable to non-western populations.

Many studies indicate that Qigong is more effective than usual care of wait-list control conditions at improving health outcomes. For example, Oh *et al.* [71] found significantly improved quality of life, fatigue, mood, and inflammation among a Qigong group compared to a control group after controlling for baseline health characteristics and sociodemographic information. In sum, Qigong interventions may produce similar health effects as other mind-body practices but also may be more efficacious at improving health than usual care. However, more research is needed to examine the differences between Qigong and other mind-body forms, as well as other forms of intervention to determine effectiveness, feasibility, and adherence for older adults.

Length of practice

There is some evidence that the length of practice can widely vary and still produce desirable health outcomes. A few studies indicate that 30 minutes of practice once is sufficient time for Qigong practice to produce psychological benefits, likely due to its similarities with other meditations which focus on positive affect [47,56]. In addition, the positive effects of Qigong can measurably last past a study's intervention period for at least 4 months. With an 8-week intervention, Lynch *et al.* [81] found that participants who practiced at least 5 hours a week, as outlined in the protocol, sustained improved health regarding pain levels, sleep function, and overall health between the end of the eight-week intervention and the end of six month follow up. Further, the authors found that participants who practiced less than 3 hours a week during the eight-week intervention still experienced improved health, though not to the magnitude of individuals who practiced per protocol. This may be due to the efficacy of Qigong and/or the likelihood of older adults to maintain regular practice of Qigong. Indeed, there is some indication that Qigong is well suited for older adults due to its adaptability to functional ability and physical and meditative components [2,46]. Qigong's low intensity encourages continued exercise adherence [74]. Qigong appears to be effective regardless of practice length; however, more methodological rigorous research exploring the particular effects of the length of practice and effect of adherence is needed.

Limitations

Despite these significant findings, there are some limitations to the current state of Qigong trial research among older adults. First, small sample size makes it difficult to ascertain effectiveness. Second, there issues regarding how Qigong interventions are conducted. Many articles do not reference the type of Qigong practiced which may influence the intended health effects. Further, there is no generic form of Qigong, which calls to question how closely the type of Qigong used in these research trials resembles traditional forms, whether the cultural component of Qigong influences researchers and participants, and whether Qigong is treated just as a low-intensity exercise.

Due to the lack of investigation in current literature, the role of culture or belief in Qigong practice remains plausible. In areas of biomedicine, cultural belief has been shown to impact compliance [84], which could also influence health outcomes. When investigating a practice or treatment such as Qigong which often explicitly incorporates non-biomedical beliefs about "energy," considering the influence of beliefs is necessary to examine which components may influence the outcome. Further, there is evidence that this concept of *Qi*, which does not have a biomedical analogue, is very important among Qigong practitioners [11]. Given a majority of the articles in this review do not include participants of East Asian descent and significant results are still found, it may be possible to conclude that Qigong has widespread appeal and the potential to be an effective intervention for older adults, independent of traditional cultural relevancy. However, there are unique experiences of Chinese and East Asian older adults [85-102], and it is necessary to thoroughly examine how culturally relevant practices like Qigong may specifically relate to their health.

Future research directions

In order to further understand the practice and effects of Qigong among older adults, there are multiple areas of research which should be addressed concerning study design, the complexities of Qigong, and the role of culture. It should be noted that CAM researchers have proposed a variety of directions for research pertaining to older adults which apply to Qigong research as well, including: understanding motivations for use or practice, safety concerns, longitudinal study design, larger sample size, including qualitative or ethnographic study design, and challenging the common health research approach of a biomedical framework [103]. Specific to research of older adults and Qigong, a variety of studies are needed to understand Qigong practice among Chinese older adults, since they are the most likely practitioners, as well as the specific health outcomes of Qigong practice among older adults. Longitudinal, population-based studies should be conducted in community-dwelling Chinese older adult communities to understand the current practice of and sociodemographic and health associations with Qigong. Existing studies of Chinese older adults have been able to understand the prevalence of health conditions and some health behaviors [89,104-108]; the next step should include information about culturally relevant exercise behaviors with additional qualitative interviews to understand their practice of Qigong.

In addition, research needs to be conducted which excludes middle-age or young adults. A study design which includes adults of all ages is insufficient to ascertain how Qigong particularly affects health in older adult practitioners. Future studies should examine older adults alone given the different abilities to learn, practice, and adhere to exercise than younger adults. In addition, future research needs to evaluate the effectiveness of different forms of Qigong and other mind-body exercise, particularly Tai Chi, a similar and less meditative exercise to Qigong, in order to ascertain appropriateness of these exercises for older adults with different functional abilities.

Moreover, Qigong research should further investigate the possible mechanisms of Qigong health promotion. Many authors seem to indicate the relative success of Qigong is due to its equation with low intensity exercise or active physical therapy [58]. However, it is unknown if there is a particular belief or cultural influence in Qigong practice, adherence, or health effects. Clinical trial research should be standardized, as the current discrepancies in study design makes emerging trends difficult to define. This includes intervention and control designs, type of Qigong, consistent measurements, and other related covariates such as belief in CAM or *Qi*. There is some indication that other Chinese healing practices have undergone acculturation when adapted for Western populations [12]. However, to our knowledge, only one study [55] examined the correlates of CAM beliefs and Qigong-related health outcome. Future research should include an examination on whether cultural specificity impact CAM health outcomes, i.e. if Chinese practicing Qigong has greater impact on health versus non-Chinese practicing Qigong, and whether CAM beliefs, regardless of ethnic origin, impacts health outcomes. Relatedly, there are likely other physiological mechanisms which contribute to Qigong health outcomes which should be investigated further.

Implications for practice and policy

Despite the limitations of current Qigong research regarding older adults, this review has implications for health providers and policymakers. Recent CAM research of older adults has called for further integration of non-biomedical biomedical options for addressing certain health concerns [103]. We have found that Qigong may improve a variety of medical conditions and that it can be adapted for a variety of functional abilities, speaking towards its safety in practice and application. Health providers should provide information to older adults about Qigong as exercise, especially since there is some evidence that Qigong practice lowers medical costs and visits [10]. Relatedly, community leaders and policy makers should work towards making Qigong available to large groups of people. Research into exercise adherence among older adults has shown that psychosocial aspects of group exercise and exercise adaptability to a variety of functional abilities influences the likelihood of continued exercise and overall well-being [109-112]. In addition, there is evidence, though limited, that ethnic minority older adults prefer group exercise environments [113]. Integrating Qigong classes into community exercise offerings may be able to address these issues of maintaining exercise in advancing age, especially for minority adults who desire culturally-specific group exercise activities [114].

Conclusion

In conclusion, the existing body of research regarding Qigong and older adults indicate that Qigong may be an effective way of improving health outcomes, including overall quality of life, psychological distress, and pain. Future research of Qigong practice in older adult populations should specifically examine the role of relative age and health conditions in the feasibility and adaptability of Qigong exercise, health outcomes, and exercise adherence. Research methodology should rigorously evaluate Qigong versus other forms of mind-body exercise and whether cultural specificity and CAM beliefs affect health outcomes. Last, researchers, health providers, and community leaders should work in concert to investigate and improve the physical and psychosocial health and health behaviors of older adults through culturally appropriate and adaptable exercise like Qigong.

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