

The traditional Chinese Baduanjin exercise for the enhancements in health of older adults: a narrative review

Fung Kei Cheng

Hong Kong

Abstract

Health debilitation negatively impacts the physical and psychiatric states of ageing persons, consequently increasing individual, familial, and social burdens. Physical exercise is an effective measure to cope with this problem, and Baduanjin, a traditional Chinese exercise, is one of the choices. This narrative review analyses 58 clinical studies, which indicate the efficacy of Baduanjin for the health of old adults, including in physiological refinement, bone diseases, cardiovascular and cardio-pulmonary illnesses, metabolic disorders, digestive sicknesses, cognitive impairment, and mental disorders. The results not only reveal the rehabilitative and preventive functions of Baduanjin, but also suggest health promotion through this physical activity for the ageing population. It also proposes improvements in methodological design and practical implications for the well being of seniors and successful ageing.

Introduction

Population ageing has become a global issue. Demographic studies predict that the number of individuals aged over 60 will exceed the number of adolescents by about 2047,¹ challenging social economics,² organizational productivity,³ and individual health.⁴

Physiological changes are inevitable during the ageing process, which diminishes the functional status of older adults. About 81% of people who are 65 years old or older complain of having at least one chronic illness.⁵ Age-related impairments are prevalent, particularly hearing⁶ and visual⁷ deficits that will cause them to misperceive the world around them and miscommunicate with others.⁸ An increase in neuro-degenerative diseases,⁹ such as Alzheimer's disease, increases their vulnerability. Non-communicable illnesses¹⁰ devastate mobility of the ageing population; for example, hypertension, and diabetes. Risks of falling increase due to sarcopenia and

dynapenia, which refer to age-associated loss of muscle mass¹¹ and muscle strength^{12,13} respectively. More harmfully, older adults always suffer from emotional disorders,¹⁴ especially with depression.¹⁵ These ailments intensify disabilities, and thus obstruct normal daily activities,¹⁶ resulting not only in social isolation¹⁷ and unfavorable quality of life¹⁸ but also expanded private and public medical expenses.¹⁹

Physical activity²⁰ is a critical strategy²¹ benefiting physical function, as well as cognitive and mental health for seniors. It includes a variety of resistance exercise training^{22,23} and aerobic exercises,²⁴ such as rowing,²⁵ swimming,²⁶ walking,²⁷ dancing,²⁸ pilates,²⁹ yoga,³⁰ and conventional fitness exercises.

Traditional Chinese exercise is one of the effective approaches,³¹ and includes Qigong and Taiji (Tai Chi Quan), which benefit physical and psychological health for the aged.^{32,33} Ameliorated conditions encompass such items as reductions in knee osteoarthritis incurred pain and stiffness,³⁴ and enhancement in motor function induced by Parkinson's disease.³⁵ Qigong is an umbrella term, covering a spectrum of exercises such as Baduanjin, Tuna (a kind of breathing method), and Xianggong. Based on traditional Chinese medicinal theory³⁶ and the I-Ching principle³⁷ (related to the yin-yang principle), Baduanjin, also known as the eight-brocade exercise, eight-section brocades or eight-treasured exercise, was used for health training in the form of a martial art, and has recently been adopted for community-based health promotion by the General Administration of Sport of China.³⁸ A set of eight sequential movements is stipulated³⁹ involving body-trunk, limb and eye movements that are matched with breathing: *holding the hands high with palms up to regulate the internal organs* (雙手托天理三焦), *posing as an archer shooting both left-and-right-handed* (左右開弓似射鵰), *holding one arm aloft to regulate the functions of the spleen and stomach* (調理脾胃須單舉), *looking backwards to prevent sickness and strain* (五勞七傷向後瞧), *swinging the head lowering the body to relieve stress* (搖頭擺尾去心火), *moving the hands down the back and legs and touching the feet to strengthen the kidneys* (兩手攀足固腎腰), *thrusting the fists and making the eyes glare to enhance strength* (攢拳怒目增氣力), and *raising and lowering the heels to cure disease* (背後七顛百病消).

In addition to the principal standing form, Baduanjin also has sitting and lying modes. The sitting form focuses on meditation, oral and auricular proliferation, and upper limb training, while the lying method

Correspondence: Fung Kei Cheng,
Hong Kong
E-mail: oasischeng@yahoo.com

Key words: Anti-ageing; complementary and alternative therapy; health promotion; gerontology; martial art; narrative review; qigong; rehabilitation; successful ageing; traditional Chinese medicine.

Conflict of interest: the author declares no conflict of interest.

Received for publication: 28 March 2018.
Revision received: 11 July 2018.
Accepted for publication: 20 August 2018.

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0).

©Copyright F.K. Cheng, 2018
Licensee PAGEPress, Italy
Geriatric Care 2018; 4:7449
doi:10.4081/gc.2018.7449

inclines towards self-massaging for facial organs (eyes, ears, mouth, and nose), limbs, and the trunk. These forms are adaptable for practitioners with different movement capabilities and disparate ages,⁴⁰ being both flexible and safe.⁴¹ Therefore, they are suitable for not only healthy older adults but also older people with Parkinson's disease,⁴² cardiovascular autonomic balance,⁴³ cognitive impairment⁴⁴ or blood lipid levels.⁴⁵ Baduanjin is beneficial to gait and balance for stroke rehabilitation,⁴⁶ fall prevention, and emotional health.⁴⁷

This narrative review investigates the effectiveness of Baduanjin, a body-mind intervention,⁴⁸ on the biological and psychological health of old adults. Its analysis offers an overview of the research results and highlights encouraging indicators that are favorable for health promotion among seniors, from which medical professionals can integrate this low-intensity exercise into available treatments for geriatric care.

Research Method

This narrative review utilized ProQuest to search potential studies, in which there are 27 prominent electronic databases, including British Nursing Index, Medical Database, MEDLINE, ProQuest Medical Library, PsycARTICLES, and PsycINFO. Inputting the keywords *Baduanjin* and *aged OR elderly OR elders OR old OR senior* resulted in 45 references. Additionally, the China National Knowledge Infrastructure

(CNKI) and Taiwan Electronic Periodical Services (TEPS) were searched using the keywords 八段錦 and 老年人, retrieving 85 Chinese works.

A two-tiered selection process was performed under the following eligibility criteria: they were required to be empirical studies (quantitative, qualitative or mixed inquiries) published in peer-reviewed, scholarly journals prior to October 2017. Non-resultant trials, duplicates, literature reviews, book reviews, dissertations, editorials, letters to the editor, and commentaries were excluded. First, 75 (n=30 in English, n=45 in Chinese) out of 130 potential articles were selected (Figure 1) according to the exclusion criteria; second, 58 (n=10 in English, n=48 in Chinese) studies were chosen for further analysis in light of the inclusion criteria.

Findings and Discussion

The reviewed 58 projects (Table 1)⁴⁹⁻¹⁰⁶ involved 5084 participants, most of whom were aged 60-84. This narrative review analyzed how Baduanjin can benefit older adults, initially detailing its contribution to physiological refinement, and subsequently enumerating its efficacy on ageing problems, including bone diseases, cardiovascular and cardio-pulmonary illnesses, metabolic disorders, digestive sicknesses, cognitive impairment, and mental health.

Physiological refinement

Baduanjin positively influences antioxidant capacity and immune cells, achieving anti-ageing.⁸⁵ It indicates a range of health enhancements, with the aid of measurements, for instance, Medical Outcomes Study Questionnaire Short Form 36 Health Survey (SF-36), Chinese Version of the Personal and Social Performance Scale (PSP-CHN), Chronic Disease Self-Management Study Measures, and tests for arithmetic, figure recognition, reaction time, digit width, and digit symbol. It delays hypophrenia (connected to intelligence recession) and metabolic oxygen consumption, and regulates the endocrine system, hemodynamics, hemorheology, cardiac functions, and nervous system.¹⁰⁶ It is conducive to the reduction of bodily pain, and the increase of vitality, general health perception, health transition, physical functioning, physical-role functioning, emotional-role functioning, social functioning and mental health.¹⁰⁵ Also, this exercise alleviates retirement syndrome⁵⁸ and therefore strengthens self-awareness, attention, emotion coping, sense of well being linked to

self-care, and social relationships, resulting in self-efficacy⁸⁴ even among older adults with chronic illnesses.

Sixty-two elderly males (aged 60-69) who practiced Baduanjin regularly over three years enhanced their body quality, balance ability and cardiovascular capability.⁴⁹ Managing obesity with better body weight, body fat mass, waist-hip ratio, body total moisture, and protein quality, they improved their balance, showing amelioration of issues with muscle strength, seat body flexion, hand grip, and standing on one leg while closing their eyes. Their vital capacity, systolic blood pressure, diastolic blood pressure, and resting pulse became more acceptable. According to evidence from another 139 women,⁶⁷ Baduanjin produced refinements in the respiratory system and body anteflexion in the sitting position, increased lower limb strength, decreased waist circumfer-

ence, hip circumference, and thickness of abdominal skinfold, the upper arm and the scapular. Overall improvements were attained in body shape, body composition, physical fitness, nervous response, immune function, sex hormone level, and free radical scavenging ability,^{81,98} as supported by pertinent research.^{72,79}

Bone disease and arthritis

Osteoporosis is a common disease among older adults, causing fractures, disability, and pain.¹⁰⁷ Pain alleviation was reported by 60 patients with primary osteoporosis⁵¹ who also experienced better mental states after undertaking eight weeks of Baduanjin training, such as vitality, emotional role functioning and social role functioning. Consistent outcomes were delivered by Peng and team in their research.⁷⁷

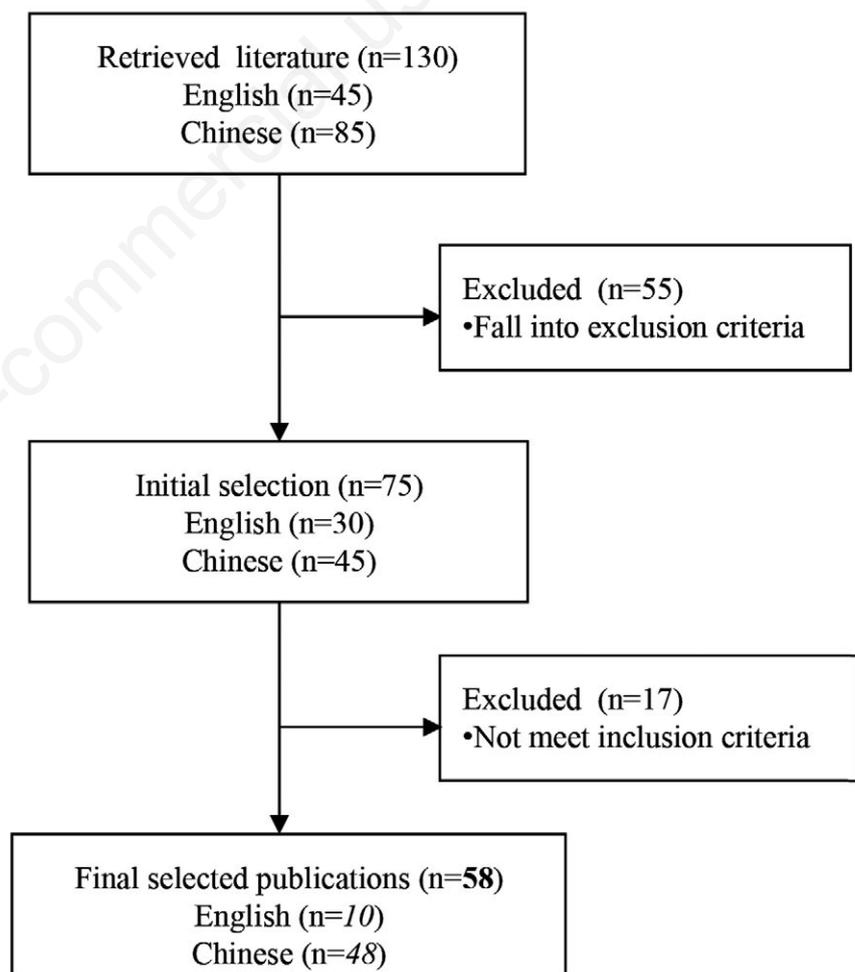


Figure 1. Selection Process.

Although osteoarthritis may be avoidable within the ageing population, degenerative joint condition is attributable to this disease,¹⁰⁸ particularly with knee osteoarthritis,¹⁰⁹ for which various treatments are provided.¹¹⁰ An and colleagues⁸⁸ offered a one-year program to 22 patients who suffered from knee osteoarthritis. The participants saw significant easing of pain, stiffness, and disability, probably caused by a decrease in body-mass index when practicing 30 minutes of Baduanjin daily, five times a week, which enhanced knee extensors, flexor strength, and aerobic ability. Their earlier research also reported enhanced quadriceps strength.¹⁰³ The effectiveness of Baduanjin on this illness has been ostensive.⁶⁵ Similarly, patients with chronic neck pain benefited from 30-minute daily sessions for six months.⁸⁶

Falling and fear of falling disturbs this frail population, especially for those with osteoporosis¹¹¹ or osteoarthritis,¹¹² giving rise to threats such as hip and vertebral fractures,¹¹³ and limb function limitations.¹¹⁴ Recent studies illustrated that Baduanjin practitioners are capable of preventing falls,^{55,63} as a result of boosting balance^{50,64} and coping with the fear of falling.⁷⁶ A reduction in fall risk not only satisfactorily adjusts functional behavior,⁶² but also more importantly provided a better quality of life.⁵⁹

Cardiovascular and cardio-pulmonary diseases

Cardiovascular and cardio-pulmonary diseases weaken heart function and the respiratory system of seniors¹¹⁵ who suffer from hypertension, coronary artery disease, or obstructive pulmonary disease.

The effects of Baduanjin on hypertension^{82,93} include improvements in heart rate⁶⁸ and blood pressure: showing a decrease in systolic blood pressure but an increase in diastolic blood pressure,⁷³ along with a reduction in serum endothelial levels,⁵⁴ improved sleep quality, sleep duration and sleep efficiency.⁷¹ Consequently, this exercise diminishes the risk of heart failure, stroke, and arteriosclerosis.⁷⁵

Supported by 50 patients with coronary artery disease, a randomized controlled trial showed reductions in angina attacks and their duration after three months of Baduanjin exercise.⁶⁵ Furthermore, improved rehabilitation was observed from another 60 patients with coronary artery bypass grafting who completed 23 weeks of training in which they performed 30-minute daily practice sessions.⁹⁵

Interaction between hypertension, heart sickness, and stroke has been unveiled,^{116,117} for the management of which Baduanjin

plays a positive role.¹¹⁸ This exercise is suitable for stroke rehabilitation,¹⁰⁰ and is related to physical and psychological health. In addition to 30 minutes of daily practice, 83.3% of 60 older patients who underwent acupoint (a specific point for acupuncture) massage 2-3 times every day saw relief from constipation during the post-stroke period.⁹¹

An estimated 14% of individuals aged 65 or over suffer from chronic obstructive pulmonary disease due to ageing respiratory systems.¹¹⁹ Baduanjin may represent an optional intervention.¹²⁰ With the aid of an XXG-D cardiovascular function tester and a pneumometer, 48 elderly patients with cardio-pulmonary problems who practiced 30 minutes of Baduanjin daily for one year increased the compensatory force of the heart pump, cardiac contractility, cardiac output stroke volume, as well as pulmonary function, together with enhancements in myocardial oxygen supply, their bodies' scavenging ability of oxygen free radicals, and respiratory endurance.¹⁰⁴ Feng and team¹⁰² added that the efficacy of this exercise could increase the forced expiratory volume in one second (FEV1), and forced vital capacity (FVC). A positive correlation between the strength of lung function and emotional stability connects this exercise to such issues as depression and anxiety,⁶¹ and to quality of life.⁶⁹

Metabolic syndrome

Metabolic abnormality is fatal in the ageing population.¹²¹ Baduanjin is a possible vehicle for combating this.

Comparing pre- and post-test outputs, a study of a 10-week Baduanjin training program⁷⁴ discerned increases in levels of nitric oxide (with a lower level in patients with diabetes) and superoxide dismutase (which is a key component in anti-oxidative and anti-inflammatory activities), particularly in elderly males, and a decrease in malondialdehyde (a hazardous compound inducing oxidative stress), particularly in elderly females.

Serum lipid levels correlate to illnesses such as cardiovascular diseases and diabetes.¹²² An investigation into the effectiveness of Baduanjin on blood lipid and antioxidant levels^{70,80} indicated decreases in triglyceride, total cholesterol, malonyldialdehyde, low-density lipoprotein, whole blood viscosity, low shear blood viscosity and plasma viscosity, in contrast to increases in high-density lipoprotein, superoxide dismutase and glutathione peroxidase. Thus, these are able to ameliorate problems in the respiratory system.⁸⁹

A decrease in blood glucose among elderly individuals who carried out a 30-minute Baduanjin session twice a day for

three months⁹⁹ shows promise for dealing with diabetes. Such a reduction in glycosylated hemoglobin (HbA1c) together with this exercise is linked to better psychological health,⁸⁷ including a decrease in depressive symptoms.⁹⁶ In research carried out by Xiao and colleagues,⁶⁰ Baduanjin was shown to be beneficial to balance, body flexibility and glucose metabolism among elderly people with diabetes who received 96 45-minute sessions; following which they exhibited stronger physical function, limb strength and flexibility of the joints, fortified nerves, and improved glucose and lipid parameters.

Digestive ailments

Age-related changes in intestinal microbiota increase the risks of illness, including inflammatory bowel disease, colon rectal cancer, and immune system deficiencies.¹²³ Indicators presented advantageous effects of Baduanjin in positive changes in intestinal flora,⁹⁷ decreasing the quantity of enterobacter and fusobacterium, while increasing the quantity of bifidobacterium, lactobacillus and the ratio of bifidobacterium and enteric bacilli.

Approximately 10-20% of elderly people experience irritable bowel syndrome,¹²⁴ with pain, cramping, and other negative signs. Looking into the efficacy of Baduanjin on irritable bowel syndrome,¹⁰¹ 60 patients saw improvements in abdominal pain, abdominal distension, constipation, and abnormal defecation.

Cognitive impairment

Age-directed cognitive decline deteriorates individual health, social connections, and social economy,¹²⁵ for which both pharmaceutical and non-medication measures are given to combat this decline. Lin⁵³ recruited 47 participants who suffered from mild cognitive impairment and who received Baduanjin with standard treatment (including diet control, psychoeducation, and counseling) for six months. The data marked significant improvements in memory, attention, association, and language. Another set of data⁵⁶ inferred these benefits from a decrease in rsFC between the DLPFC and the left putamen and insula, whereas mental control enhancement is negatively associated with rsFC and DLPFC-putamen changes. Tao and team⁵⁷ identified an evident increase in grey matter volume in the insula, medial temporal lobe, and putamen among their informants who participated in 60 30-minute Baduanjin sessions. As a result, practicing this exercise positively correlates to mental control, recognition, touch, cognition and comprehensive memory.

Mental health

The detrimental effects of psychotic disorders consist of personal ill-being and social deprivation¹²⁶ among older people, for which the scope of traditional and innovative approaches pinpoint Baduanjin¹²⁷ as an effective countermeasure.¹²⁸ One study, which interviewed 20 informants who practiced Baduanjin 40 minutes daily for 12 weeks, reiterated that they felt relaxed physically and psychologically due to self-tranquility, pleasure, and relief from emotional symptoms.⁷⁸ Another 180 participants saw improvements in somatization, obsession and interpersonal sensitivity, and lessened depression, anxiety, hostility, phobia, paranoia and psychotic symptoms after 20 weeks, during which they received six one-hour Baduanjin training sessions each week.⁹⁰ In particular, these sessions favor housebound elderly people⁵² who are afterwards able to reconnect with society.

Practitioner calmness⁹² also helps abate sleep difficulties, accomplishing overall sleep quality,⁹⁴ including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, and controlled daytime dysfunction.

Methodological limitations and future research directions

This narrative review addresses methodological limitations among the reviewed articles, which arise from conducting randomized controlled research with small sample sizes and a cross-sectional design, particularly focusing on Chinese population and using mainly psychometric surveys. It also gives suggestions for future studies.

Despite there being 36 (62%) randomized controlled trials among the reviewed research, incomplete fulfillments are notable. While this method values evidence-based assessment,¹²⁹ it requires strong reliability and validity, especially through randomization. However, most randomized controlled projects in this review failed to demonstrate random allocation, blinding, prevention of selection bias, and details of p-value. This study suggests the need for well-designed scientific research, such as through a proper randomization process, not only for convincing results but also for research replication.

Nineteen (32%) of the reviewed articles were carried out with less than 61 participants. A small sample size can potentially undermine data performance, cross-validation, and statistical power.¹³⁰ In order to attain data confidence, this study proposes

future research on the efficacy of Baduanjin in senior health with a larger number of informants, which would enable such studies to be more powerful.

The reviewed studies are cross-sectional inquiries: 16 (27%) were six-month programs, two (3%) were one-year projects, and the remainder was less than these or unspecified. This research strategy restricts the findings to within a specific time span, which offers insufficient cause-and-effect results, and is inappropriate for age-associated research.¹³¹ Instead, longitudinal studies would feasibly rectify these weaknesses and measure intra-individual changes:¹³² which is why they are usually utilized for age-oriented research.

All the reviewed projects involve only a Chinese population, which may engender sampling bias. Such a constraint leads to homogeneity and limits representativeness and generalization. It is therefore necessary to extend the research to non-Chinese elderly people in order to bolster the evaluation.

The reviewed studies are dominated by self-administered psychometric surveys and basic physiological measurements (for example, blood pressure, and forced vital capacity). However, they tend to refrain from elaborating on the mechanisms of physiological changes that occur when practicing Baduanjin, such as on cardiac function and antioxidant capacity. It is advisable to adopt the medical tools necessary to measure the biomarkers that underpin clinical data for scientific research. Furthermore, this review proposes the use of evaluation tools, such as Performance Oriented Mobility Assessment (POMA), in future research to measure practical advantages of this exercise.

Despite positivist quantitative research acquiring a larger pool of data in a shorter time, there is a lack of qualitative inquiries (only one within the reviewed references) and therefore it is unable to represent the social reality experienced by the participants. This study recommends that qualitative or mixed research be conducted that allows informants (perhaps with case examples) to disclose their experience in practicing Baduanjin.

Practical implications

Owing to the presence of more promising results, combined therapy is not rare within the reviewed research: 14 (24%) projects demonstrate this; Baduanjin with varied instruments, such as cognitive behavioral therapy,⁵² medication,⁵⁴ meditation,⁵⁸ dance,⁶⁸ diet management,⁷² or mas-

sage.⁹¹ An integrative model is therefore suggested, for instance, simultaneously using with music therapy,¹³³ which may further enhance the physical and emotional health of the aged.

Although positive signals are exhibited, the findings do not suffice to confirm the curative effects of Baduanjin, owing to the methodological weaknesses explained previously. However, it is apparent that older patients with different illnesses show significant enhancements in health when practicing this exercise, demonstrating rehabilitative and preventive capabilities. Baduanjin likely contributes to health promotion through disease prevention, such as through the prevention of ischemic stroke,¹³⁴ and relapse prevention.

A healthy state and long-term engagement in physical activity are positively correlated.¹³⁵ It is highly recommended that Baduanjin be practiced 30 minutes regularly either in an individual or group setting: the latter also promotes psychological health¹³⁶ and social relationships.¹³⁷

Despite the fact that Baduanjin is safe and learner-friendly, this review suggests to recruit a qualified instructor in order to maximize the benefits of this exercise, especially for the elderly. The General Administration of Sport of China provides a set of training programs for various levels of instructors, associated with development, theories and techniques of Baduanjin.

A sound lifestyle substantially determines life expectancy. Baduanjin cannot be the sole agent of older adults' health and well-being. This study encourages active ageing¹³⁸ or successful ageing¹³⁹ that connects to holistic involvement, including healthy habits,¹⁴⁰ nutrition,¹⁴¹ relaxation,¹⁴² religious participation,¹⁴³ lifetime learning,¹⁴⁴ volunteering,¹⁴⁵ and leisure/recreation activities¹⁴⁶ such as handicrafts,¹⁴⁷ and travel.¹⁴⁸

Conclusions

Baduanjin, a traditional Chinese exercise, is a body-mind, learning-friendly, safe, self-paced, cost-effective, convenient, non-intrusive, low-intensity exercise. Its anti-ageing capabilities rejuvenate the physical and psychological health of the older individuals. This narrative review reveals that this physical activity is conducive to health promotion due to its rehabilitative and preventive effectiveness, resulting in quality of life and well-being and a large population of people who age successfully.

Table 1. Analysis of the reviewed 58 clinical projects.

Source	Research objective	Sample size	Intervention	Results
Cao and Shi ⁴⁹	To look into the effect of regular Baduanjin on health of older adults.	62 men, aged 60-69, who practiced Baduanjin 30 minutes daily, >3 times a week, >3 years.	Assigned to the Baduanjin (n=32), and control (n=30) groups.	Improvements in body weight, body fat mass, waist-hip ratio, muscle content, body total moisture, protein quality, systolic blood pressure, diastolic blood pressure, rested pulse, vital capacity, seat body flexion, grip, closed eyes standing with one leg, choice reaction, and balance ability.
Chen, Pei ⁵⁰	To investigate the effect of Baduanjin and balance pad on balance of older adults and fall prevention.	80 participants (n=34 males, n=46 females), aged 60-70.	Randomly allocated to the Baduanjing (n=20; n=8 males, n=12 females), balance pad (n=20; n=7 males, n=13 females), combined (n=20; n=11 males, n=9 females), and non-treatment (n=20; n=8 males, n=12 females) groups. Baduanjin: 20-minute session, 6 times a week, 12 weeks. Balance pad: 20-minute session, 6 times a week, 12 weeks. Combined exercise: each 10 minutes for Baduanjin and balance pad, 6 times a week, 12 weeks.	Significant improvements in balance ability in exercise groups, whereas best in combined exercise group, second in Baduanjin, and then in balance pad.
Chen, Xiong ⁵¹	To look into the effect of Baduanjin on pain management and overall health among patients with primary osteoporosis.	60 patients with primary osteoporosis (n=15 males, n=45 females), aged 55-71.	Randomly assigned to the Baduanjin with assorted treatment (n=30; n=8 males, n=22 females), and assorted treatment (n=30; n=7 males, n=23 females) groups. Baduanjin: 40-60 minutes a session, twice a day, 8 weeks. Medication: calcium carbonate and vitamin D3 tablets, twice a day, 8 weeks. Low-frequency impulse magnetic stimulation: 20-minute session, 5 times a week, 8 weeks.	Much significant alleviation of pain in Baduanjin with assorted treatment group than that in assorted treatment a group. Better improvements in mental state in Baduanjin with assorted treatment group than that in assorted treatment group, including vitality, general health perception, mental health, physical functioning, physical role functioning, emotional role functioning, and social role functioning.
Jin, Xing ⁵²	To compare the effect of Baduanjin and cognitive behavioural therapy on the housebound elderly.	118 participants (n=40 males, n=78 females), aged 60-97.	Randomly assigned to the Baduanjin (n=39; n=11 males, n=28 females; aged 62-97), cognitive behavioural therapy (n=40; n=12 males, n=28 females; aged 60-95), and combined therapy (n=39; n=17 males, n=22 females; aged 60-87) groups. Baduanjin: 30 minutes daily, 5 times a week, 6 months. Cognitive behavioural therapy: 1-1.5 hours a session, once a week, 6 months.	Significant reduction in housebound in combined therapy, then Baduanjing, and then cognitive behavioural therapy groups. Activity of Daily Living Scale: highest scores in combined therapy, then cognitive behavioural therapy, and then Baduanjin groups.
Lip ⁵³	To examine the effect of Baduanjin on mild cognitive impairment.	94 patients with mild cognitive impairment (n=58 males, n=36 females), aged 61-79.	Randomly distributed to the Baduanjin plus standard treatment (n=47; n=28 males, n=19 females; aged 61-79), and standard treatment (including diet control, psychoeducation, counseling) (n=47; n=30 males, n=17 females; aged 63-78) groups. 6 times a week, 6 months.	Significant improvements in memory, attention, association, language, depressive symptoms, and quality of life in Baduanjin plus standard treatment after 6 months, while enhancements began after 3 months.

To be continued on next page

Table 1. Continued from previous page.

Source	Research objective	Sample size	Intervention	Results
Lin and Yan ⁵⁴	To examine the effect of Baduanjin and Amlodipine Besylate on hypertension among older adults.	116 patients with hypertension (n=62 males, n=54 females), average aged at 58.	Randomly assigned to the Baduanjin and Amlodipine Besylate (drug) (n=58), and Amlodipine Besylate (n=58) groups. Baduanjin: 30-40 minutes daily, 5 times a week, 6 months. Amlodipine Besylate: 5mg daily.	Better improvements in systolic blood pressure, diastolic blood pressure and heart rate, and a decrease in serum endothelin in the combined therapy group.
Shi ⁵⁵	To compare the effect of Baduanjin and walking on fall prevention.	104 participants (n=53 males, n=51 females), aged 55-75.	Randomly distributed to the Baduanjin (n=52; n=25 males, n=27 females; aged 55-74), and walking (n=52; n=28 males, n=24 females; aged 56-75). Baduanjin: 30-40 minutes per session, 12 weeks. Walking: 40-60 minutes a day, 12 weeks.	Better improvements in balance ability, fall prevention, and quality of life.
Tao, Chen ⁵⁶	To compare the effect of Taiji and Baduanjin on cognitive control network.	61 participants (n=20 males, 41 females), average aged at 62.	Assigned to the Baduanjin (n=15; n=6 males, n=9 females), Taiji (n=21; n=8 males, n=13 females), and non-treatment (n=25; n=6 males, n=19 females) groups. 60-minute session, 5 times a week, 12 weeks.	Both Taiji Chuan and Baduanjin groups demonstrated significant improvements in mental control function. The Tai Chi Chuan group showed a significant decrease in rsFC between the DLPFC and the left superior frontal gyrus (SFG) and anterior cingulate cortex. The Baduanjin group showed a significant decrease in rsFC between the DLPFC and the left putamen and insula. Mental control improvement was negatively associated with rsFC DLPFC-putamen changes across all subjects.
Tao, Liu ⁵⁷	To compare the effect of Taiji and Baduanjin on grey matter volume.	61 participants (n=20 males, n=41 females), average aged at 62.	Assigned to Baduanjin (n=16; n=6 males, n=10 females), Taiji (Yang style 24-form) (n=21; n=8 males, n=13 females), and non-treatment (n=24; n=6 males, n=18 females) groups. 30-minute session, 5 times a week, 12 weeks.	Both groups significantly increased grey matter volume (GMV) in the insula, medial temporal lobe, and putamen. No significant differences were observed in GMV between 2 groups. Taiji Chuan and Baduanjin significantly improved visual reproduction subscores on the WMS-CR. Baduanjin also improved mental control, recognition, touch, and comprehension memory subscores of the WMS-CR compared to the control group. Memory quotient and visual reproduction subscores were both associated with GMV increases in the putamen and hippocampus. Improvements in cognition and memory.
Wang, Hao ⁵⁸	To look into the effect of Baduanjin and meditation on retirement syndrome.	89 patients with retirement syndrome (n=56 males, n=33 females), aged 49-68.	Randomly assigned to the Baduanjin and meditation (n=45; n=29 males, n=16 females; aged 49-68), and Baduanjin (n=44; n=27 males, n=17 females; aged 51-67) groups. Baduanjin: 1 hour daily, 3 months. Meditation: 1 hour daily, 3 months.	More significant improvements in Baduanjin and meditation group than these in Baduanjin group, including self-awareness, social activities, attention, emotion coping, sense of well-being, social relationships, self-care, and disturbing behavior.
Wu, Xue ⁵⁹	To evaluate the effect of Baduanjin on fall prevention.	120 participants (n=36 males, n=84 females), aged 65-80.	Randomly distributed to the Baduanjin (n=60; n=18 males, n=42 females, aged 65-80), and non-treatment (n=60; n=18 males, n=42 females, aged 65-80) groups. 2 times a day, 30 days.	Significant improvements in fall prevention, mental health, and quality of life in Baduanjin group.

To be continued on next page

Table 1. Continued from previous page.

Source	Research objective	Sample size	Intervention	Results
Xiao, Zhuang ⁶⁰	To assess the effects of Baduanjin on balance and fitness ability in older adults with type 2 diabetes mellitus.	94 patients with type 2 diabetes mellitus (n=40 males, n=54 females), aged 60-70.	Randomly allocated to the Baduanjin, and no treatment groups. 45-minute session, 4 times a week, 24 weeks.	Improvements in arm curls right, 30-second chair stand, back scratch-right, right chair sit-and-reach, left chair sit-and-reach, 6-minute walk test, and Timed Up-and-Go, and a decrease in glycosylated haemoglobin (HbA1c) in Baduanjin group. Better improvements in lung function, depressive and anxiety symptoms in Baduanjin group.
Cao, Guo ⁶¹	To compare the effect of Baduanjin and walking on lung function, depression, and anxiety among old adults with chronic obstructive pulmonary disease.	102 patients with chronic obstructive pulmonary disease (n=62 males, n=40 females), average aged at 70.	Randomly allocated to the Baduanjin (n=52; n=31 males, n=21 females), and walking (n=50; n=31 males, n=19 females) groups.	Reduced fall risk, and improved mental health and quality of life in Baduanjin group. More significant improvements in function, functional behavior, environment, sensory loss in Baduanjin group.
Chen, Xu ⁶²	To examine the effect of Baduanjin on fall risk and mental health among older adults.	100 participants (n=51 males, n=49 females) average aged at 67.	Allocated to the Baduanjin (n=50; n=24 males, n=26 females), and walking (n=50; n=27 males, n=23 females) groups. Baduanjin: 30 minutes daily, 5 times a week, 24 weeks. Walking: 30-60 minutes daily, 24 weeks.	Better improvements in balance ability, and fall prevention in Baduanjin group.
Liu, Gao ⁶³	To investigate the effect of Baduanjin on balance ability of old people.	95 participants (n=20 males, n=75 females), averaged aged at 67.	Distributed to the Baduanjin (n=47; n=9 males, n=38 females), and walking (n=48; n=11 males, n=37 females) groups. 40-minute session, 12 weeks.	Increases in balance ability, and fall prevention.
Liu and Yi ⁶⁴	To assess the effect of Baduanjin on fall prevention.	47 participants, aged over 60. Unspecified sex ratio.	30-40 minutes daily, 12 weeks.	Significant and more decreases in angina attacks and its duration, anxiety and depression, and improvement in quality of life in combined therapy group.
Wang, Guan ⁶⁵	To compare the effect of Baduanjin and medication on coronary artery disease.	50 patients with coronary artery disease (n=31 males, n=19 females), aged 60-70.	Randomly assigned to the Baduanjin with standard care (n=25; n=15 males, n=10 females), and standard care (n=25; n=16 males, n=9 females) groups. 3 months.	Better improvements in Baduanjin group.
Wang and Meng ⁶⁶	To compare the effect of Baduanjin and medication on knee osteoarthritis.	60 patients with knee osteoarthritis (n=27 males, n=33 females), aged over 60.	Randomly distributed to the Baduanjin (n=30; n=14 males, n=16 females), and medication (n=30; n=13 males, n=17 females) groups. 30-minute session, 5 times a week, 3 months. Medication: Meloxicam, 7.5mg, twice daily, 3 months.	Improvements in respiratory system, blood pressure, grip, pulmonary capacity, body ante-flexion in sitting position, lower limb strength, body weight, waist circumference, hip circumference, waist-hip ratio, and thickness of abdominal skinfold, upper arm and scapular in both groups. No significant differences between the 2 groups.
Wu, Fan ⁶⁷	To compare the effect of Baduanjin on women in different ages.	139 women, aged 45-65.	Distributed to the middle aged (aged 45-55) (n=60), and senior (aged 56-65) (n=79) groups. 1 hour daily, 7 days a week, 90 days.	Improvements in emotion, blood pressure and heart rate.
Xu, Li ⁶⁸	To assess the effect of Baduanjin and dance on hypertension of older adults.	115 patients with hypertension (n=62 males, n=53 females), average aged at 65.	Randomly assigned to the Baduanjin and dance (n=58; n=30 males, n=28 females), and non-treatment (n=57; n=32 males, n=25 females) groups. 50-60 minutes per session, 4 times a week, 12 weeks.	

To be continued on next page

Table 1. Continued from previous page.

Source	Research objective	Sample size	Intervention	Results
Ye ⁶⁸	To evaluate the effect of Baduanjin on quality of life among patients with chronic obstructive pulmonary disease.	80 patients with chronic obstructive pulmonary disease (n=51 males, n=29 females), average aged at 65.	Randomly allocated to the Baduanjin with standard treatment (n=40; n=25 males, n=15 females), and standard treatment (n=40; n=26 males, n=14 females) groups. Baduanjin: 40-minute session, twice a day, 5 times a week, 4 weeks. Standard treatment: oxygenotherapy, abdominal breathing, half-closed lip respiratory training, diet control, drug.	Better improvements in vitality, bodily pain, general health perception, mental health, physical functioning, physical role functioning, emotional role functioning, and social role functioning in Baduanjin group.
Zhang, Ma ⁷⁰	To investigate the effect of Baduanjin on blood lipid level and antioxidant level.	50 participants (n=22 males, n=28 females), aged 55-65.	Randomly allocated to the Baduanjin (n=25), and non-treatment (n=25) groups. 40 minutes daily, 3 times a week, 6 months.	Decreases in triglyceride, total cholesterol, malondialdehyde, low-density lipoprotein, whole blood viscosity, low shear blood viscosity and plasma viscosity, and increases in high-density lipoprotein, superoxide dismutase and glutathione peroxidase in Baduanjin group.
Chen, Liu ⁷¹	To examine the effect of Baduanjin and psychoeducation on quality of sleep among older adults with hypertension.	60 patients with hypertension (n=31 males, n=29 females), aged 60-75.	Distributed to the Baduanjin with psychoeducation (n=30; n=14 males, n=16 females; aged 60-75), and psychoeducation (n=30; n=17 males, n=13 females; aged 62-73) groups. 1-hour session, twice a day, 3-4 times a week, 12 weeks.	Better improvements in blood pressure, quality of sleep, sleep duration, and sleep efficiency in combined therapy.
He, Shi ⁷²	To examine the effect of Baduanjin and diet control on sub-health among older adults.	72 participants, average aged at 65. Unspecified sex ratio.	Randomly allocated to the Baduanjin with diet control (n=36), and diet control (n=36) groups. 30 minutes daily, 6 months.	Better improvements in overall health state in Baduanjin with diet control group.
He ⁷³	To investigate the effect of Baduanjin (sitting form) and standard care on hypertension among older adults.	84 patients with hypertension (n=45 males, n=39 females), average aged at 69.	Randomly distributed to the Baduanjin (sitting form) and standard care (n=42; n=22 males, n=20 females), and standard care (n=42; n=23 males, n=19 females) groups. 30 minutes daily, 5 days a week, 12 weeks.	Greater decrease in systolic blood pressure and increase in diastolic blood pressure in Baduanjin group than in standard care group.
Huang and Chang ⁷⁴	To compare the effects of Baduanjin on the metabolism of nitric oxide, malondialdehyde, and superoxide dismutase on the middle-aged and older adults.	44 participants (n=21 males, n=23 females), aged 45-65.	Assigned to the middle-aged (n=22; n=10 males, n=12 females; aged 45-55), and older adults (n=22; n=11 males, n=11 females; aged 56-65) groups. 50 minutes daily, 7 times a week, 10 weeks.	Increases in levels of nitric oxide and superoxide dismutase, particularly in the male elderly. A decrease in malondialdehyde, particularly in the female elderly.
Lin and Lin ⁷⁵	To evaluate the effect of Baduanjin (lying form) and standard care on hypertension.	60 patients with hypertension (n=34 males, n=26 females), aged 65-82.	Allocated to the Baduanjin (lying form) and standard care (n=30; n=18 males, n=12 females; aged 65-80), and standard care (n=30; n=16 males, n=14 females; aged 65-82) groups. 30 minutes daily.	No cases of heart failure and stroke, and 1 case of arteriosclerosis in Baduanjin and standard care group, which showed significantly better than standard care group.
Liu, Gao ⁷⁶	To assess the effect of Baduanjin on fall prevention.	95 participants (n=20 males, n=75 females), average aged at 67.	Assigned to the Baduanjin (n=47; n=9 males, n=38 females), and walking (n=48; n=11 males, n=37 females) groups. Baduanjin: 30-40 minutes a session, twice a day, 12 weeks. Walking: 40-60 minutes a day, 12 weeks.	More significant increase in fall prevention and decrease in fear of fall.

To be continued on next page

Table 1. Continued from previous page.

Source	Research objective	Sample size	Intervention	Results
Peng, Li ⁷⁷	To assess the effect of Baduanjin (sitting form) and Chinese medicine on osteoporosis.	91 patients with osteoporosis (n=43 males, n=48 females), average aged at 69.	Randomly distributed to the Baduanjin (sitting form) and Chinese medicine (n=47; n=21 males, n=26 females), and Chinese medicine (n=44; n=22 males, n=22 females) groups.	Much higher score in Baduanjin and Chinese medicine group than in Chinese medicine group.
Zheng, Fang ⁷⁸	To examine the effect of Baduanjin on physical and psychological benefits.	20 participants (n=11 males, n=9 females), aged 50-69.	40 minutes daily, 5 times a week, 12 weeks.	Improvements in digestive function, circulatory system function, immunity and sleep quality, relaxed body and moods, and enhanced self-tranquility, pleasure, and symptom relief.
Bai, Tien ⁷⁹	To compare the effect of Baduanjin and physical exercise on health among older females.	100 women, average aged at 61.	Distributed to the Baduanjin (n=50), and physical activity (n=50) groups. Baduanjin: 90-minute session, 12 weeks. Physical activity: 90 minutes daily.	More improvements in abdominal fat mass, and body weight in Baduanjin group.
Gu and Hu ⁸⁰	To investigate the effect of Baduanjin and Taiji on blood lipid among older adults.	93 participants (n=45 males, n=48 females), aged 45-70.	Randomly assigned to the middle aged (n=43; n=20 males, n=23 females; aged 46-60), and elderly (n=50; n=25 males, n=25 females; aged 60-70) groups. Baduanjin: 1 hour daily, 6-7 times a week, 6 months. Taiji: 30-minute session, twice a daily, 6 months.	Decreases in total cholesterol, and low-density lipoprotein, and increase in high-density lipoprotein in both groups.
Hu and Gu ⁸¹	To assess the effect of Baduanjin on health of older adults.	109 participants (n=55 males, n=44 females), aged 53-70.	Randomly distributed to the Baduanjin (n=55; n=25 males, n=20 females), and non-treatment (n=54; n=30 males, n=24 females) groups. 30-60 minutes daily, 4-7 times a week, 6 months.	Significant improvements in bodily pain, vitality, general health perception, physical functioning, physical role functioning, social role functioning, and mental health in Baduanjin group. Decreases in systolic blood pressure and diastolic blood pressure, but increases in vital capacity, grip strength, leg balance ability in Baduanjin group. Improvements in the body shape, body composition, physical fitness, cardiovascular function, immune function, blood lipids, sex hormone level, free radical scavenging ability, and mental health level in Baduanjin group.
Lin and He ⁸²	To compare the effect of Baduanjin and medication on stage one hypertension.	55 patients with hypertension (n=26 males, n=29 females), average aged at 62.	Randomly allocated to the Baduanjin (n=27; n=14 males, n=13 females), and medication (Amlodipine Besylate) (n=28; n=12 males, n=16 females) group. Baduanjin: 30 minutes per session, twice a day, 12 weeks. Medication: Amlodipine Besylate 5mg daily, 12 weeks.	Effect rate: 85% in Baduanjin group, 89% in medication group.
Liu, Gao ⁸³	To assess the effect of Baduanjin on quality of life among older adults.	95 participants. Unspecified sex ratio, and age range.	Randomly distributed to the Baduanjin (n=47), and walking (n=48) groups. Baduanjin: 30-40 minutes daily, 12 weeks. Walking: 40-60 minutes daily, 12 weeks.	More significant improvements in Baduanjin group than in walking group, including bodily pain, general health, vitality, social functioning, role-emotional functioning, and mental health.
Liu, Peng ⁸⁴	To assess the effect of Baduanjin with standard care on self-efficacy among older adults with chronic diseases.	119 patients (n=69 males, n=50 females), average aged at 77.	Distributed to the Baduanjin with standard care (n=59), and standard care (n=60) groups. 30 minutes daily, 24 weeks.	Significant improvement in self-efficacy in combined therapy group.

To be continued on next page

Table 1. Continued from previous page.

Source	Research objective	Sample size	Intervention	Results
Qiu, Pan ⁸⁵	To examine the effect of Baduanjin on anti-ageing.	146 participants, average aged at 62. Unspecified sex ratio.	Randomly distributed to Baduanjin (n=72), and diet control (n=74) groups. 90-minute session, twice a day, 5 times a week, 24 weeks.	Significant improvements in antioxidant capacity and immune cells.
Wang, Guo ⁸⁶	To evaluate the long-term effect of Baduanjin on chronic neck pain.	69 patients with chronic neck pain (n=18 males, n=51 females), average aged at 58.	Assigned to Baduanjin (n=34; n=7 males, n=27 females), and control (n=35; n=11 males, n=24 females) groups. 30 minutes daily, 6 months.	Baduanjin groups achieved significantly greater improvement than the controls in visual analogue scale, Northwick Park Neck Pain Questionnaire, and SF-36 health transition scores than these in control group. There were no significant differences between the 2 groups in SF-36 physical or mental component summaries.
Wei and Wu ⁸⁷	To compare the effect of Baduanjin, walking and drug on type II diabetes.	60 patients with type II diabetes (n=38 males, n=22 females), aged 54-73.	Randomly assigned to the Baduanjin (n=20), walking (n=20), and drug (n=20) groups. Baduanjin: 3 times a day, 5 times a week, 3 months. Walking: 30 minutes daily, 5 times a week, 3 months.	Better improvements in diabetes symptoms and mental health in Baduanjin group than in other groups.
An, Wang ⁸⁸	To evaluate the effect of regular Baduanjin on knee osteoarthritis.	22 patients (n=3 males, n=19 females), aged 55-82.	30-minute session, 5 times a week, 1 year.	Reductions in pain, stiffness, disability, and improvement in emotional health. A decrease in BMI enhanced knee extensors and flexors strength and patients aerobic ability. No adverse effect.
Bao, Wang ⁸⁹	To look into the effect of Baduanjin on vital capacity.	105 participants, aged 55-65. Unspecified sex ratio.	30 minutes daily, twice a day, 3 months.	Improvements in the respiratory system.
Cheit ⁹⁰	To investigate the effect of Baduanjin on mental health of older adults.	180 participants (n=79 males, n=89 females), aged 60-84.	Randomly allocated to the Baduanjin (n=80; n=38 males, n=42 females; aged 60-82), and non-treatment (n=88; n=41 males, n=47 females; aged 60-84) groups. 1-hour session, 6 times a week, 20 weeks.	Significant improvements in mental health, including somatisation, obsession, interpersonal sensitivity, depression, anxiety, hostility, phobia, paranoid, and psychosisism.
Men, Li ⁹¹	To examine the effect of Baduanjin with acupoint massage and standard care on constipation among older adults after stroke.	60 patients (n=31 males, n=29 females), average aged at 64.	Randomly assigned to the Baduanjin with acupoint massage and standard care (n=30; n=15 males, n=15 females), and standard care (n=30; n=16 males, n=14 females) groups. Baduanjin: 30 minutes daily. Acupoint massage: 2-3 times daily.	Effect rate: 83.3% in Baduanjin with acupoint massage and standard care group, 6.7% in standard care group.
Shen, Jing ⁹²	To compare the effect of Taiji, Baduanjin, Wuqinxi, Yijinjing, and walking on mental health and immune function.	362 participants, average aged at 61. Unspecified sex ratio.	Distributed to the Taiji (n=67), Baduanjin (n=83), Wuqinxi (n=19), Yijinjing (n=27), walking (n=81), and no exercise (n=135) groups.	Taiji controlled anger. Baduanjin improved calm. Wuqinxi increased the focus attention level. Yijinjing improved well-being. Walking reduced depression.
Zhang and Ai ⁹³	To compare the effect of Baduanjin (sitting form) and drug on hypertension among older adults.	120 patients with hypertension (n=52 males, n=68 females), average aged at 75.	Randomly distributed to the Baduanjin (sitting form) (n=60; n=28 males, n=32 females), and drug (n=60; n=24 males, n=36 females) groups.	Effect rate: 83% in Baduanjin group, 52% in drug group.
Chen, Liu ⁹⁴	To investigate the effect of Baduanjin on sleep quality.	55 participants (n=19 males, n=36 females), average aged at 71.	Randomly assigned to the Baduanjin (n=27; n=10 males, n=17 females), and non-treatment (n=28; n=9 males, n=19 females) groups. 30-minute session, 3 times a week, 12 weeks.	Enhancements in overall sleep quality, subjective sleep quality, sleep latency, sleep duration, sleep efficiency, and daytime dysfunction in Baduanjin group. Significantly better sleep quality in Baduanjin group after four weeks, which was maintained throughout the 12-week exercise period.

To be continued on next page

Table 1. Continued from previous page.

Source	Research objective	Sample size	Intervention	Results
Lin, Chen ⁹⁵	To compare the effect of Baduanjin (lying form) and walking on rehabilitation after coronary artery bypass grafting.	60 patients with coronary artery bypass grafting (n=46 males, n=14 females), average aged at 65.	Randomly allocated to the Baduanjin (lying form) (n=30; n=22 males, n=8 females) groups. Baduanjin: 30 minutes daily, 4-5 times a week, 23 weeks. Walking: 30-100 minutes a session, 3 times a day, 23 weeks.	Great improvements in rehabilitation and exercise skills in Baduanjin group.
Liu, Huo ⁹⁶	To compare the effect of Baduanjin and community care on depression and quality of life among patients with type II diabetes.	69 patients with type II diabetes (n=28 males, n=41 females), average aged at 64.	Randomly assigned to the Baduanjin (n=33; n=14 males, n=19 females), and community care (n=36; n=14 males, n=22 females) groups. 40 minutes daily, 3-5 times a week, 12 weeks.	Much significant improvements in depressive symptoms and mental health in Baduanjin group. Greater reduction in glycosylated hemoglobin (HbA1c) in Baduanjin group than in community care group.
Sun ⁹⁷	To assess the effect of Baduanjin on changes of intestinal flora.	45 participants (n=22 males, n=23 females), average aged at 63.	40-50 minutes daily, 6 times a week, 6 months.	Significantly decreased the quantity of enterobacter and fusobacterium, but increased the quantity of bifidobacterium, lactobacillus and the ratio of bifidobacterium and enteric bacilli.
He, Yao ⁹⁸	To investigate the effect of Baduanjin on health of older women in army.	80 women in army, aged 61-65.	Randomly allocated to the Baduanjin (n=40), and non-treatment (n=40) groups. 45 minutes daily, 20 weeks.	More increases in superoxide dismutase and close eyes one-foot balance, and improvements in the level of sexual hormone, nervous response and balance ability in Baduanjin group than these in non-treatment group. Delayed free radical injury in Baduanjin group.
Liu, Guo ⁹⁹	To compare the effect of Baduanjin and walking on blood glucose among older adults. Unspecified sex ratio.	95 participants, aged 55-65.	Assigned to the Baduanjin (n=47), and walking (n=48) groups. Baduanjin: 30-minute session, twice a day, 3 months. Walking: 30-minute session, twice a day, 3 months.	A decrease in blood glucose in Baduanjin group, but an increase in walking group.
Cai ¹⁰⁰	To compare the effect of Baduanjin (sitting form) and education on stroke rehabilitation.	60 patients with stroke (n=43 males, n=17 females), average aged at 61.	Randomly assigned to the Baduanjin (sitting form) (n=30; n=20 males, n=10 females), and education (n=30; n=23 males, n=7 females) groups. 30 minutes daily, 4-5 times a week, 3 months.	More significant improvements in physical health, psychological health, social relationships, environment, health perception, and living quality perception in Baduanjin group than in education group.
Feng, Bian ¹⁰¹	To look into the effect of Baduanjin on irritable bowel syndrome.	60 patients with irritable bowel syndrome (n=36 males, n=24 females), average aged at 66.	Randomly allocated to the Baduanjin with medication (n=30; n=17 males, n=13 females), and medication (n=30; n=19 males, n=11 females) groups. 45-minute session, twice a day, 12 weeks. Medication: Tegaserod, 6mg.	Effect rate: 90% in Baduanjin with medication group, 83% in medication group. Improvements in abdominal pain, abdominal distension, constipation, and abnormal defecation.
Feng, Pan ¹⁰²	To investigate the effect of Baduanjin on chronic obstructive pulmonary disease among older adults.	60 patients with chronic obstructive pulmonary disease (n=39 males, n=21 females), average aged at 63.	Randomly distributed to the Baduanjin (n=30; n=18 males, n=12 females), and control (n=30; n=21 males, n=9 females) groups. 45-minute sessions, twice a day, 5 days a week, 24 weeks.	Improvements in forced expiratory volume in one second (FEV1), forced vital capacity (FVC), 6-minute walk distance.
An, Dai ¹⁰³	To examine the effect of Baduanjin on women with knee osteoarthritis.	21 women, average aged at 65.	Randomly assigned to the Baduanjin (n=11), and non-treatment (n=10) groups. 30-minute session, 5 sessions a week, 8 weeks.	Decreases in pain, stiffness, and disability in Baduanjin group. Improvements in quadriceps strength and aerobic ability in Baduanjin group.

To be continued on next page

Table 1. Continued from previous page.

Source	Research objective	Sample size	Intervention	Results
Pan ¹⁰⁴	To assess the effect of Baduanjin on cardio-pulmonary function.	48 patients with cardio-pulmonary problems (n=22 males, n=26 females). Unspecified age range.	30 minutes daily, 1 year.	Increases in compensatory force of heart pump, cardiac contractility, cardiac output stroke volume, and pulmonary function. Improvements in myocardial oxygen supply, scavenging ability of oxygen free radicals, and respiratory endurance.
Wang, Zhu ¹⁰⁵	To look into the effect of Baduanjin on health among older adults.	200 participants (n=100 males, n=100 females), average aged at 60.	Randomly allocated to the Baduanjin (n=120, n=60 males, n=60 females), and non-treatment (n=80; n=40 males, n=40 females) groups. 1 hour daily, 7 times a week, 6 months.	More significant improvements in bodily pain, vitality, general health perception, health transition, physical functioning, physical-role functioning, emotional-role functioning, social functioning, mental health in Baduanjin group.
Wang ¹⁰⁶	To test the effect of Baduanjin on health and intelligence among older adults.	113 participants (n=42 males, n=71 females), aged 56-65.	Distributed to the Baduanjin (n=58; n=22 males, n=36 females), and non-treatment (n=55; n=20 males, n=35 females) groups. 1 hour daily, 5-7 times a week, 6 months.	Delayed hypohyprenia (intelligence recession), and decreased metabolic oxygen consumption. Increased mental activities and self confidence. Enhanced immune system, endocrine system, haemodynamics, haemorrhology, cardiac functions, and regulation of nervous system

References

- Miranda LCV, Soares SM, Silva PAB. Quality of life and associated factors in elderly people at a Reference Centre. *Ciência Saúde Coletiva* 2016;21:3533-44.
- Bloom DE, Chatterji S, Kowal P, et al. Macroeconomic implications of population ageing and selected policy responses. *Lancet* 2015; 385:649-57.
- Aiyar S, Ebeke C, Shao X. The impact of workforce ageing on European productivity. Washington, DC, USA: International Monetary Fund; 2016.
- Thakur RP, Banerjee A, Nikumb VB. Health problems among the elderly: A cross-sectional study. *Ann Med Health Sci Res* 2013;3:19-25.
- Tiwari SC, Trichal M, Mehrotra B, Najeeb S. A study of awareness of health problems of the elderly with reference to mental health. *Delhi Psychiatr J* 2009;12:263-8.
- Contrera KJ, Wallhagen MI, Mamo SK, et al. Hearing loss health care for older adults. *J Am Board Fam Med* 2016;29:394-403.
- Pan C-W, Qian D-J, Sun H-P, et al. Visual impairment among older adults in a rural community in Eastern China. *J Ophthalmol* 2016;2016:Article ID 9620542.
- Rooth MA. The prevalence and impact of vision and hearing loss in the elderly. *N C Med J* 2017; 78:118-20.
- Batista P, Pereira A. Quality of life in patients with neurodegenerative diseases. *J Neurol Neurosci* 2016; 7:1-7.
- Wandera SO, Kwagala B, Ntozi J. Prevalence and risk factors for self-reported non-communicable diseases among older Ugandans: A cross-sectional study. *Global Health Action* 2015;8:1-11.
- Roubenoff R, Hughes VA. Sarcopenia: current concepts. *J Gerontol Med Sci* 2000;55A: M716-24.
- Clark BC, Manini TM. What is dynapenia. *Nutrition* 2012;28:495-503.
- Manini TM, Clark BC. Dynapenia and ageing: An update. *J Gerontol Series A Biol Sci Med Sci* 2012;67A:28-40.
- Andreas S, Schulz H, Volkert J, et al. Prevalence of mental disorders in elderly people: The European MentDis_ICF65+ study. *Br J Psychiatr* 2017;210:125-31.
- Esmayel EM, Eldarawy MM, Hassan MM, et al. Mental health problems and sociodemographic correlates in elderly medical inpatients in a university hospital in Egypt. *Curr Gerontol Geriatr Res* 2013;2013:1-4.
- Andrews MA, Shaji KS, Asokan Kuttichira P. Health problems of the elderly: Cross-sectional study in a rural population in Kerala. *Kerala Med J* 2015;8:14-7.
- Stephoe A, Shankar A, Demakakos P, Wardle J. Social isolation, loneliness, and all-cause mortality in older men and women. *Proc Natl Acad Sci U S A* 2013;110:5797-801.
- de Souza Pinho Costa V, Molari M, dos Santos JPM, de Freitas ERS, et al. Evaluation factors for determining the quality of life of physically independent elderly. *Manual Ther Posturo Rehab J* 2015;13:1-8.
- de Nardi M, French E, Jones JB, McCauley J. Medical spending of the US elderly. *Fiscal Stud J Appl Publ Econ* 2016;37:717-47.
- Sun F, Norman IJ, While AE. Physical activity in older people: A systematic review. *BMC Public Health* 2013; 13:1-17.
- Rosenberg DE, Bombardier CH, Hoffman JM, Belz B. Physical activity among persons ageing with mobility disabilities: Shaping a research agenda. *J Ageing Res* 2011;2011:1-16.
- Law TD, Clark LA, Clark BC. Resistance exercise to prevent and manage sarcopenia and dynapenia. *Annu Rev Gerontol Geriatr* 2016;36:205-28.
- Peterson MD, Rhea MR, Sen A, Gordon PM. Resistance exercise for muscular strength in older adults: A meta-analysis. *Ageing Res Rev* 2010;9:226-37.
- Kwon I-H, Song J-Y, Kim D-Y, et al. Comparison of rhythmic and non-rhythmic aerobic exercises on depression and balance in the elderly. *Phys Ther Rehab Sci* 2017;6:146-51.
- Asaka M, Kawano H, Higuchi M. Rowing as an aerobic and resistance exercise for elderly people. *J Phys Fitness Sports Med* 2012;1: 227-34.
- Merom D, Stanaway FF,

- Handelsman DJ, et al. Swimming and other sporting activities and the rate of falls in older men: longitudinal findings from the concord health and ageing in men project. *Am J Epidemiol* 2014;180:830-7.
27. Lee J-Y, Lee D-C. Cardiac and pulmonary benefits of forest walking versus city walking in elderly women: A randomised, controlled, open-label trial. *Eur J Integr Med* 2014;6:5-11.
28. Guzman-Garcia A, Johannsen L, Wing AM. Dance exercise for older adults: A pilot study investigating standing balance following a single lesson of danzon. *Am J Dance Ther* 2011;33:148-56.
29. Boguszewski D, Slodkowska (Ciešlik) M, Adamczyk J, Ochal A. The role of pilates and aquafitness exercises in sustaining the Health and fitness of elderly women. *Sport Sci Rev* 2012;21:127-38.
30. Farinatti P, Rubini E, Silva E, Vanfraechem J. Flexibility of the elderly after one-year practice of yoga and calisthenics. *Int J Yoga Ther* 2014;24:71-7.
31. Chen S, Zhang Y, Wang YT, Liu XL. Traditional Chinese mind and body exercises for promoting balance ability of old adults: A systematic review and meta-analysis. *Evid Based Complement Alternat Med* 2016;2016:1-9.
32. Guo Y, Shi H, Yu D, Qiu P. Health benefits of traditional Chinese sports and physical activity for older adults: A systematic review of evidence. *J Sport Health Sci* 2016;5:270-80.
33. Dong XQ, Bergren S. Qigong among older adults: A global review. *Clin Res Trials* 2016;2:120-44.
34. Zhang Y, Huang L, Su Y, et al. The effects of traditional Chinese exercise in treating knee osteoarthritis: A systematic review and meta-analysis. *PLoS One* 2017;12:1-18.
35. Yang Y, Qiu WQ, Hao YL, et al. The efficacy of traditional Chinese medical exercise for Parkinson's disease: A systematic review and meta-analysis. *PLoS One* 2015;10:1-18.
36. Su X, Ru K. On Eight Segments of Brocade (Baduanjin) and its creation and compilation theory. *J Capital College Phys Educ* 2002;14:85-7.
37. Koh TC. Baduanjin: An ancient Chinese exercise. *Am J Chin Med*. 1982;10:14-21.
38. General Administration of Sport of China. *Baduanjin*; 2013. Available from: <http://www.sport.gov.cn/n16/n1107/n1638/3886341.html>
39. Chinese Health Qigong Association. *Baduanjin*; 2014. Available from: <http://jsqg.sport.org.cn/en/illustration/2008-12-03/226049.html>
40. Zou L, Wang C. Traditional Chinese baduanjin qigong for older adults. *Open Access J Gerontol Geriatr Med* 2017;1:1-2.
41. Li R, Jin L, Hong P, et al. The effect of baduanjin on promoting the physical fitness and health of adults. *Evid Based Complement Alternat Med*. 2014;2014:1-8.
42. Xiao C, Zhuang Y, Kang Y. Effect of health qigong baduanjin on fall prevention in individuals with Parkinson's disease. *J Am Geriatr Soc* 2016;64:e227-e8.
43. Wang S, Zhou X, Wang A. Effect of Ba-Duan-Jin on cardiovascular autonomic balance in aged women. *Res Q Exerc Sport* 2014;5:A89-90.
44. Zheng G, Huang M, Li S, et al. Effect of Baduanjin exercise on cognitive function in older adults with mild cognitive impairment: Study protocol for a randomised controlled trial. *BMJ Open* 2016;2016:1-10.
45. Wen J, Lin T, Jiang C, et al. Effect of Baduanjin exercises on elevated blood lipid levels of middle-aged and elderly individuals: protocol for a systematic review and meta-analysis of randomised controlled trials. *BMJ Open* 2017;2017:1-6.
46. Chen B-L, Guo J-B, Liu M-S, et al. Effect of traditional Chinese exercise on gait and balance for stroke: A systematic review and meta-analysis. *PLoS One* 2015;10:1-15.
47. Wang X, Pi Y, Chen B, et al. Effect of traditional Chinese exercise on the quality of life and depression for chronic diseases: A meta-analysis of randomised trials. *Sci Rep* 2015;5:1-16.
48. Chen T, Yue GH, Tian Y, Jiang C. Baduanjin mind-body intervention improves the executive control function. *Front Psychol* 2017;7:1-5.
49. Cao B, Shi F. An analysis of regular practising Baduanjin on health and body composition among the male elderly. *Sport* 2017;153:155-6.
50. Chen GP, Pei F, Wang Y. Balance of the elderly and fall prevention by Baduanjin with balance pad. *Chinese J Rehab* 2017;32:141-2.
51. Chen Y, Xiong XJ, Liu H, et al. Effect of Baduanjin on pain management and quality of life among patients with primary osteoporosis. *China's Naturopathy* 2017;25:18-9.
52. Jin AP, Xing FM, Jing LW, Wang FL. Effect of Baduanjin with cognitive behavioural therapy on Activity of Daily Living Scale among the housebound elderly housebound. *Chinese J Gerontol* 2017;37:698-70.
53. Lin Q. Effect of Baduanjin on patients with mild cognitive impairment and improvements in cognitive function. *Chinese J Gerontol* 2017;37:3358-60.
54. Lin Q, Yan XH. Effect of Baduanjin on hypertension among the elderly. *Chinese J Gerontol* 2017;37:3324-6.
55. Shi XY. Effect of Baduanjin on fall prevention among old people. *Modern Diagn Treat* 2017;28:222-3.
56. Tao J, Chen X, Egorova N, et al. Tai Chi Chuan and Baduanjin practice modulates functional connectivity of the cognitive control network in older adults. *Sci Rep* 2017;7:1-9.
57. Tao J, Liu J, Liu W, et al. Tai Chi Chuan and Baduanjin increase grey matter volume in older adults: A brain imaging study. *J Alzheimer Dis* 2017;60:389-400.
58. Wang X-J, Hao Z-W, Li J-N, et al. Effect of mindfulness meditation training combined with Ba Duan Jin exercise on retirement syndrome. *Shanghai Nurs* 2017;17:22-6.
59. Wu X, Xue W, Fang J, et al. Baduanjin of movements on the risk of falls in community elderly people for 60 cases. *Chinese Med Modern Distance Educ China* 2017;15:106-9.
60. Xiao CM, Zhuang YC, Kang Y. Effects of Ba Duan Jin Qigong on balance and fitness ability in older adults with type 2 diabetes mellitus. *J Tradit Med Clin Naturopathy* 2017;6:1-3.
61. Cao C, Guo X, Chen N, et al. Research of effects of eight-section brocade of TCM on treating anxiety and depression in the elderly patients with lung-spleen qi deficiency in stable period of COPD. *J Liaoning Univ Tradit Chinese Med* 2016;18:120-3.
62. Chen C, Xu H, Gu Q, Wu J. Study on the effect of group baduanjin exercises on fall risk and quality of life of elderly patients. *Chinese Commun Doct* 2016;32:170-2.
63. Liu X-Y, Gao J, Yin B-X, et al. Efficacy of Ba Duan Jin in improving balance: A study in Chinese community-dwelling older adults. *J Gerontol Nurs* 2016;42:38-46.
64. Liu X, Yi B. Application and effect of eight-section brocade exercise therapy in prevention of fall in community elderly. *Chinese Nursing Res* 2016;20:423-5.
65. Wang R, Guan F, Yan X. Qigong Baduanjin rehabilitation of elderly patients with coronary artery disease. *J Changchun Univ Chinese Med* 2016;32:752-4.
66. Wang CM, Meng LG. A clinical study

- of Baduanjin in treating knee osteoarthritis. *Cardiovasc Dis J Integrat Trad Chinese Western Med* 2016;4:158.
67. Wu S, Fan Y, Huang L. Study of influence of Baduanjin exercise on middle and old-aged women. *Bull Sport Sci Technol* 2016;24:41-3.
 68. Xu W, Li M, Yao J. Intervention of collective exercise on the mental health of elderly hypertensive patients. *Iran J Public Health* 2016;45:314-21.
 69. Ye XP. Effect of Baduanjin on quality of life among the elderly with chronic obstructive pulmonary disease. *Today Nurse* 2016;2016:80-2.
 70. Zhang J, Ma X, Sun X-Q, Wang J. Effects of health-care qigong Baduanjin on the blood lipid level and antioxidant level of the middle-aged and aged people. *Shandong Sports Sci Technol* 2016;38:65-8.
 71. Chen YQ, Liu RZ, He R. Effect of Baduanjin on quality of sleep among the elderly with hypertension. *Hunan J Tradit Chinese Med* 2015;31:52-3, 82.
 72. He Y, Shi HL, Zhao MJ, et al. 36 cases of using Baduanjin in sub-health among the elderly. *J Extern Ther Tradit Chinese Med* 2015;24:9-11.
 73. He X. Rehabilitation therapeutic effect of baduanjin training in aged patients with hypertension. *Chinese J Cardiovasc Rehab Med* 2015;24:252-4.
 74. Huang T, Chang JD. Influence of body building Qigong and eight-section brocade on the metabolisms of nitric oxide, malondialdehyde and superoxide dismutase in middle-aged and elderly people of different gender. *Chinese J Clin Rehab*. 2015;9:162-4.
 75. Lin XM, Lin WZ. 60 cases of using Baduanjin (lying form) in hypertension among the elderly. *Fujian J Tradit Chinese Med* 2015;46:75-6.
 76. Liu X, Gao J, Bai D, et al. Study on influence of eight-sectioned exercise on falls efficacy in community elderly. *Chinese Nursing Res* 2015;29:90-3.
 77. Peng X, Li Q, Li X. The efficacy of sitting Baduanjin exercise on lumbago and back pain of elderly patients with osteoporosis. *J Nursing Sci* 2015;30:4-6.
 78. Zheng G, Fang Q, Chen B, et al. Qualitative evaluation of Baduanjin (traditional Chinese qigong) on health Promotion among an elderly community population at risk for ischemic stroke. *Evid Based Complement Alternat Med* 2015;2015:1-10.
 79. Bai SG, Tien Y, Qiu Y. Effect of Baduanjin on body composition among the female elderly. *Chinese Rural Health Serv Admin* 2014;34:1164-5.
 80. Gu KP, Hu GX. Effect of Baduanjin and Qigong on blood lipid among the elderly. *Chinese Rural Health Serv Admin* 2014;34:1027-8.
 81. Hu G, Gu K. Effects of Qigong eight section brocade exercise on quality of life of the elderly in a district, Jilin. *Med Soc* 2014;27:74-6.
 82. Lin F, He QX. Effect of Baduanjin on stage one hypertension among the elderly. *Chinese J Geriatric Care* 2014;12:25-6.
 83. Liu X, Gao J, Bai D, et al. Influence of Ba Duan Jin exercise on quality of life of elderly in community. *Chinese Gener Pract Nursing* 2014;12:577-9.
 84. Liu Q, Peng DZ, Wang H, Li FY. Effect of Baduanjin on self-efficacy among the elderly with chronic diseases. *Chinese J Convalescent Med* 2014;23:414-6.
 85. Qiu WM, Pan HS, Wen X, et al. Effect of Baduanjin on anti-ageing. *J N Chinese Med* 2014;46:82-4.
 86. Wang J-Y, Guo H, Tang L, et al. Case-control study on regular Ba Duan Jin practice for patients with chronic neck pain. *Int J Nursing Sci* 2014;1:360-6.
 87. Wei Q, Wu Y. Clinical study of Baduanjin on health status inpatients with type 2 diabetes. *J Liaoning Univ Traditional Chinese Med*. 2014;16:103-5.
 88. An B-C, Wang Y, Jiang X, et al. Effects of Baduanjin exercise on knee osteoarthritis: A one-year study. *Chin J Integr Med* 2013;19:143-8.
 89. Bao LY, Wang Y, Liu JR. Effect of Baduanjin on different levels of blood lipid and vital capacity among the elderly. *Chinese J Gerontol* 2013;33:1140-1.
 90. Chen W. Effects of Baduanjin on mental health of urban-dwelling elders. *Chinese J Gerontol* 2013;33:3472-3.
 91. Men HY, Li SX, Chen CX. Effect of Baduanjin with acupoint massage on constipation among patients with stroke. *J Hebei United Univ Health Sci* 2013;15:330-2.
 92. Shen H-J, Jing T, Wang Z-L. Comparative study on five kinds of traditional health exercises for multidimensional psychological and immune function of elder adults. *Chinese J Inf Tradit Chinese Med* 2013;20:17-20.
 93. Zhang JF, Ai J. Effects of stress reduction based Baduanjin with anti-hypertensive drugs on quality of life of the elderly with high blood pressure. *Chinese J Truma Disab Med* 2013;21:179-80.
 94. Chen M-C, Liu H-E, Huang H-Y, Chiou A-F. The effect of a simple traditional exercise programme (Baduanjin exercise) on sleep quality of older adults: A randomised controlled trial. *Int J Nurs Stud* 2012;49:265-73.
 95. Lin X-L, Chen J-W, Zhang G-Q, et al. Effects of eight sections brocade (Ba Duan Jin) on quality of life for patients after coronary artery bypass grafting. *J Nursing (China)* 2012;19:63-5.
 96. Liu Y, Huo R, Lai Y, et al. Community-based study on effects of Chinese Qigong-Baduanjin on depression symptoms and life quality of patients with type 2 diabetes mellitus. *Chinese J Sports Med* 2012;31:212-7.
 97. Sun H. Beneficial influence on the breeding and growth of intestinal flora through gymnastic Qigong-Baduanjin exercise in the aged. *Chinese J Sports Med* 2012;31:973-7.
 98. He J-H, Yao L, Chang Z, Liu G-N. The influence of new Ba Duan Jin on the physiological function in aged women of army. *Acta Acad Med CPAF* 2011;20:10-2.
 99. Liu JR, Guo YS, Zhang RF, et al. Effect of Baduanjin on glycemia among the middle-aged and older adults. *Chinese J Gerontol* 2011;31:3196-7.
 100. Cai W. Influence of sitting Baduanjin on quality of life of cerebral apoplexy patients with sequela in community. *Chinese Nursing Res* 2010;24:2667-8.
 101. Feng Y-C, Bian B-G, Pan H-S, et al. Observation of the efficacy of Baduanjin exercise on the constipation-predominant irritable bowel syndrome of the elderly. *Sport Sci Res* 2010;31:89-91.
 102. Feng YC, Pan HS, Wen X, et al. Effect of Baduanjin on the stabilised period of elderly patients with chronic obstructive pulmonary disease. *J N Chinese Med* 2009;41:36-7.
 103. An B, Dai K, Shu Z, et al. Baduanjin alleviates the symptoms of knee osteoarthritis. *J Alternat Complement Med* 2008;14:167-74.
 104. Pan HS. Effect of Baduanjin on cardiopulmonary function among the elderly. *J N Chinese Med* 2008;40:55-7.
 105. Wang S-T, Zhu H-X, Zhang Y, et al. The effects of new Baduanjin on middle/old aged people's life quality. *J Beijing Sport Univ* 2007;30:203-5.
 106. Wang S-T. Effect of Baduanjin on physiological age of intelligence for old people. *J Clin Rehab Tissue Engine Res* 2007;11:7910-3.
 107. Li G, Thabane L, Papaioannou A, et al. An overview of osteoporosis and frailty in the elderly. *BMC Musculoskelet Disord* 2017;18:1-5.
 108. Anderson AS, Loeser RF. Why is osteoarthritis an age-related disease.

- Best Pract Res Clin Rheumatol 2010;24:15-26.
109. Blagojevic M, Jinks C, Jefferys A, Jordan KP. Risk factors for onset of osteoarthritis of the knee in older adults: A systematic review and meta-analysis. *Osteoarthr Cartilage* 2010;18:24-33.
 110. Zhang W, Ouyang H, Dass CR, Xu J. Current research on pharmacologic and regenerative therapies for osteoarthritis. *Bone Res* 2016;4:1-14.
 111. Hsu W-L, Chen C-Y, Tsao J-Y, Yang R-S. Balance control in elderly people with osteoporosis. *J Formos Med Assoc* 2014;113:334-9.
 112. Ng CT, Tan MP. Osteoarthritis and falls in the older person. *Age Ageing* 2013;42:561-6.
 113. Cauley JA. Public health impact of osteoporosis. *J Gerontol A Biol Sci Med Sci* 2013;68:1243-51.
 114. McDonough CM, Jette AM. The contribution of osteoarthritis to functional limitations and disability. *Clin Geriatr Med* 2010;26:387-99.
 115. Waheed S, Chaves PHM, Gardin JM, Cao JJ. Cardiovascular and mortality outcomes in the elderly with impaired cardiac and pulmonary function: The Cardiovascular Health Study (CHS). *J Am Heart Assoc* 2015;4:1-8.
 116. Gunnoo T, Hasan N, Khan MS, et al. Quantifying the risk of heart disease following acute ischaemic stroke: A meta-analysis of over 50000 participants. *BMJ Open* 2016;6:1-8.
 117. Turin TC, Okamura T, Afzal AR, et al. Hypertension and lifetime risk of stroke. *J Hypertens* 2016;34:116-22.
 118. Zou L, Sasaki JE, Wang H, et al. A systematic review and meta-analysis of Baduanjin Qigong for health benefits: Randomised controlled trials. *Evid Based Complement Alternat Med* 2017;2017:1-7.
 119. El-Moselhy EA, Hay AHIA. Chronic obstructive pulmonary disease in the elderly. *J Gerontol Geriatr Res* 2016;5:e140.
 120. Liu X-D, Jin H-Z, Ng BH-P, et al. Therapeutic effects of Qigong in patients with COPD: A randomised controlled trial. *Hong Kong J Occupat Ther* 2012;22:38-46.
 121. Saad MAN, Cardoso GP, de Andrade Martins W, et al. Prevalence of metabolic syndrome in elderly and agreement among four diagnostic criteria. *Arq Bras Cardiol* 2014;102:263-9.
 122. Davidson MH, Kurlandsky SB, Kleinpell RM, Maki KC. Lipid management and the elderly. *Prev Cardiol* 2003;6:128-35.
 123. Magrone T, Jirillo E. The interaction between gut microbiota and age-related changes in immune function and inflammation. *Immunity Ageing* 2013;10:1-6.
 124. Kurniawan I, Kolopaking MS. Management of irritable bowel syndrome in the elderly. *Indones J Intern Med* 2014;46:138-47.
 125. Deary IJ, Corley J, Gow AJ, et al. Age-associated cognitive decline. *Br Med Bull* 2009;92:135-52.
 126. Skoog I. Psychiatric disorders in the elderly. *Canad J Psychiatr* 2011;56:387-97.
 127. Cheng FK. Effects of Baduanjin on mental health: A comprehensive review. *J Bodyw Mov Ther* 2015;19:138-49.
 128. Thirthalli J, Zhou L, Kumar K, et al. Traditional, complementary, and alternative medicine approaches to mental health care and psychological well-being in India and China. *Lancet Psychiatr* 2016;3:660-72.
 129. Mahboobi H, Khorgoei T, Bansal N. Designing, conducting and reporting randomised controlled trials: A few key points. In: Sitaras N, editor. *Evidence based medicine: Closer to patients or scientists*. Rijeka, Croatia: InTech Europe; 2012. p. 1-10.
 130. Varoquaux G. Cross-validation failure: Small sample sizes lead to large error bars. *Neuroimage* 2017 [Epub ahead of print].
 131. Hofer SM, Sliwinski MJ, Flaherty BP. Understanding ageing: Further commentary on the limitations of cross-sectional designs for ageing research. *Gerontology* 2002;48:22-9.
 132. Schaie KW. What can we learn from the longitudinal study of adult psychological development. In: Schaie KW, editor. *Longitudinal studies of adult psychological development*. New York: The Guilford Press; 1983. p. 1-19.
 133. Bruer RA, Spitznagel E, Cloninger CR. The temporal limits of cognitive change from music therapy in elderly persons with dementia or dementia-like cognitive impairment: A randomised controlled trial. *J Music Ther* 2007;44:308-28.
 134. Zheng G, Chen B, Fang Q, et al. Primary prevention for risk factors of ischemic stroke with Baduanjin exercise intervention in the community elder population: Study protocol for a randomised controlled trial. *Trials* 2014;15:1-10.
 135. Queen M, Crone D, Parker A. Long-term engagement with a practiced-based exercise referral scheme: Patients' perceptions of effectiveness. *Eur J Person Centred Healthc* 2015;3:369-76.
 136. Mortazavi SS, Shati M, Aredbili HE, et al. Comparing the effects of group and home-based physical activity on mental health in the elderly. *Int J Prev Med* 2013;4:1282-9.
 137. Chang P-J, Wray L, Lin Y. Social relationships, leisure activity, and health in older adults. *Health Psychol* 2014;33:516-23.
 138. Fernández-Ballesteros R, Robine JM, Walker A, Kalache A. Active ageing: A global goal. *Curr Gerontol Geriatr Res* 2013;2013:1-4.
 139. Yap P. What constitutes successful ageing. *Eur Health Psychol* 2015;17:62-3.
 140. Flores TR, Nunes BP, Assunção MCF, Bertold AD. Healthy habits: What kind of guidance the elderly population is receiving from health professionals. *Rev Brasil Epidemiol* 2016;19:167-80.
 141. Rivlin RS. Keeping the young-elderly healthy: Is it too late to improve our health through nutrition. *Am J Clin Nutr* 2007;86:1572S-6S.
 142. Reig-Ferrer A, Ferrer-Cascales R, Santos-Ruiz A, et al. A relaxation technique enhances psychological well-being and immune parameters in elderly people from a nursing home: A randomised controlled study. *BMC Complement Altern Med* 2014;14:1-14.
 143. Roh HW, Hong CH, Lee Y, et al. Participation in physical, social, and religious activity and risk of depression in the elderly: A community-based three-year longitudinal study in Korea. *PLoS One* 2015;10:1-13.
 144. Findsen B, Formosa M. *Lifelong learning in later life: A handbook on older adult learning*. Rotterdam, The Netherlands: Sense Publishers; 2011.
 145. Ho H-C. Elderly volunteering and psychological well-being. *Int Soc Work* 2017;60:1028-38.
 146. Rizzuto D, Orsini N, Qiu C, et al. Lifestyle, social factors, and survival after age 75: Population based study. *Br Med J* 2012;345:1-10.
 147. Kim DJ. The effects of a combined physical activity, recreation, and art and craft program on ADL, cognition, and depression in the elderly. *J Phys Ther Sci* 2017;29:744-7.
 148. Liu W, Lu H, Sun Z, Liu J. Elderly's travel patterns and trends: The empirical analysis of Beijing. *Sustainability* 2017;9:1-11.