Physical and Psychological Effects of Qigong Exercise in Community-Dwelling Older Adults: An Exploratory Study

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Abstract

Older adults need exercise programs that correspond to age-related changes. The purpose of this study was to explore preliminary effects of an 8-week Qigong exercise intervention on the physical ability, functional and psychological health, and spiritual well-being of community-dwelling older adults. Forty-five community-dwelling adults with the mean age of 74.8 years participated a 1-hour Health Qigong exercise session twice weekly for 8 weeks. The majority were female (84%) and white (91%), and lived with their spouse (49%). Physical ability ($p<0.001$), functional health ($p=0.001$), balance ($p<0.001$), functional reach ($p<0.001$), depression ($p=0.005$), and spiritual well-being ($p=0.004$) improved significantly after the 8-week intervention. Most participants perceived physical ability, mental health, and spiritual well-being benefits. No adverse events were reported. A twice weekly Qigong exercise program over 8 weeks is feasible and has potential to improve physical ability, functional health, balance, psychological health and spiritual well-being in older adults.

Key words: Qigong, older adults, functional health, spiritual well-being, psychological health

INTRODUCTION

Older adults constitute 13.3% of the United States (US) population.[1] Approximately 58% of older adults report having limitations with physical ability, including walking, grasping, or carrying.[2] Nearly 90% of adults older than 80 years have balance impairment.[3] Diminished physical ability and impaired balance adversely affect daily functioning and compromise independent living.[2,4]

Depression and anxiety are commonly experienced by people older than 75.[5] They are strongly associated with physical disability and diminished well-being.[6,7] Depressive symptoms may impede engagement in regular physical activity and lead to physical disability.[8] Spiritual well-being plays a role in older adults' psychological health, as it has been found to be associated with fewer depressive symptoms and to moderate the influence of frailty on psychological health in older adults.[9]

Exercise is beneficial to the health of older adults.[10] Older adults need exercise programs that correspond to age-related changes.[11] Qigong exercise, a Chinese traditional medicine exercise, is comprised of breathing exercise, meditation, and body movements with minimal musculoskeletal strain and can be performed by people at an advanced age.[12] The theory of Chinese traditional exercise proposes that there is vital energy "Qi" inside the body. Disturbance of vital energy flow can lead to illness or can occur as a result of illness or injury. Qigong exercise can bring the vital energy circulation back into harmony through gentle body movements, breathing exercise, and meditation, thus promoting health. Qigong exercise has demonstrated promising effects on physical function and psychological health of Chinese older adults with comorbidities.[13] Yet, the effects of Qigong on physical ability, balance, depression, anxiety, and spiritual well-being in US community-dwelling older adults are unknown. The objective of this study was to explore the preliminary effects of a structured Qigong exercise program on physical ability, functional and psychological health, and spiritual well-being in a sample of community-dwelling older adults in the US.

METHODS

Study Design

This study employed a one-group pretest-posttest design to explore the preliminary effects and feasibility of an 8-week Qigong exercise intervention on physical ability, balance, functional health, depression, anxiety, and spiritual well-being. The Yale University Human Investigation Committee approved the study protocol, and written informed consent was obtained from all participants.

Participants and Setting

Participants were recruited from two senior centers in the greater New Haven, Connecticut area from April to October of 2015. Eligibility criteria included age 65-85 years; English speaking; stable medical condition with a primary care provider's clearance to participate (not admitted to hospital emergency department in the 3 months before the study); a baseline 6-minute walk test (6MWT) of less than 554 meters for males and 530 meters for females; a Mini-Mental State Examination score of at least 25; and no severe bone, joint, or other health conditions that would limit exercise training. Exclusion criteria were current participation in a Tai chi or Qigong class in the last 6 months, unstable cardiovascular disease in the last 6 months, baseline performance of more than 240 minutes of moderate-intensity exercise weekly, use of an assistive device, or the inability to give informed consent.

Sample Size

Sample size calculations were based on a 1-group repeated measures design using a paired t-test, assuming 80% power, alpha of 0.05, effect size of 0.53, and 2-tailed test for significance. The effect size was obtained from a Qigong study where the 6-minute walk test was used as outcome measurement.[14] The sample size needed to detect a significant difference in physical ability was 31. Forty-five subjects were enrolled to allow for attrition.

Study Protocol

Flyers were used to recruit participants at the senior centers. The principal investigator (P.C.) was also present at the centers weekly to approach potential participants. Interested people were able to contact the principal investigator via email or telephone.

Interested individuals were screened for eligibility. Eligible older adults were given a consent form, and demographic and baseline data were collected. Subjects were given the schedule of the Qigong sessions, a date to start and appointments for data collection. Primary care providers were contacted to obtain permission for participation. Once the number of enrolled older adults reached at least 10, the Qigong intervention class started. Data were also collected at 8 weeks (end of the intervention).

Intervention

Health Qigong (Baduanji) was employed as the intervention after a consultation with a Qigong master, as it is easy to learn and perform without any challenging movements. The Health Qigong program consists of 8 gentle bodily movements, breathing exercises, and meditation (Figure 1). Each Qigong exercise class was taught and led by the same experienced Qigong practitioner, along with musical accompaniment. The classes were run in groups of 10 to 15 participants and occurred in the afternoon. The subjects were instructed to perform Health Qigong to moderate fatigue and use movements to guide breathing patterns. All movements were performed in a standing position at a range within the subjects' comfort zone. Each session started with a 5-minute warm-up, followed by 40 minutes of Qigong exercise, and concluded with a 5-minute relaxation. A 10-minute break was provided during each session. The participants were asked to attend the session twice weekly for 8 weeks for a total of 16 Qigong sessions, and were encouraged to practice at home using a video provided. Strategies used to ensure the intervention fidelity included directly observing randomly selected sessions and documentation of classes and hours taught (Table 1).

Conceptual Model

The Layers Model was used to guide the outcome measures of the current study. This model was created based on in-depth interviews of older adults who practiced Qigong exercise. It suggests five dimensions of Qigong exercise effects: physical, mental, emotional, social, and spiritual.[15] The Layers Model is framed as a continuum representing four increasingly complex layers of Qigong practice experiences. As people practice Qigong more intensively and longer, they may perceive that the five dimensions of Qigong exercise effects evolve from Layer 1 (Simple Benefits), to Layer 2 (Complex Benefits), to Layer 3 (Immersion), and to Layer 4 (Complex Integration). In the Complex Integration layer, Qigong affects health in a holistic way where a complex integration of physical, mental, emotional, social, and spiritual effects occurs.[15]

Outcome Measures

Baseline demographic data were obtained from participants and included age, gender, race, education, marital status, social economic status, coexisting medical conditions, weekly physical activity, and home living status.

Physical ability was evaluated by the 6MWT, which measures the distance walked on a hard and flat surface in 6 minutes. A shorter distance covered in 6 minutes indicates worse physical ability. The test-retest reliability and validity of 6MWT in community-dwelling older adults were 0.94[16] and 0.82[17] respectively.

The SF-12 was used to measure functional health. It produced physical (PCS) and mental component summary (MCS) scores; higher scores indicate better functional health. The SF-12 consists of 12 items that assess physical functioning (2 items), role limitation because of physical health (2 items), social functioning (1 item), vitality or energy (1 item), bodily pain (1 item), mental health (2 items), role limitation because of emotional problems (2 items), and general health (1 item).[18] The reliability and validity of SF-12 have been established among older adults.[19] Cronbach's alpha measure of internal consistency was reported as 0.85 for PCS and 0.76 for MCS in community-dwelling older adults.[20] The test-retest reliability of the PCS and MCS was 0.89 and 0.76, respectively.[18]

Balance was examined by the Berg Balance scale (BBS), which assesses an individual's ability to perform 14 tasks and includes a test for functional reach; higher scores indicate better balance. The functional reach test assesses the maximal length that an individual can reach forward with a fixed base of support in a standing position. The test-retest reliability was 0.91 in community-dwelling older adults.[21] The internal consistency was 0.96 in community-living older people.[22] Validity of BBS was also established in older adults with Parkinson's disease.[23]

The Hospital Anxiety and Depression scale (HADS) was used to evaluate depression and anxiety. This scale was divided into two 7-item subscales: Anxiety (HADS-A) and Depression (HADS-D) subscales. The total score is out of 42, 21 per subscale, with higher scores indicating greater levels of depression and anxiety. Validity and reliability have been established in general populations.[24] The internal consistency for HADS-A was 0.82 and 0.71 for HADS-D in people older than 65 years.[24]

Spiritual well-being was assessed by the Spirituality scale, a subscale of the Body-Mind-Spirit Well-Being Inventory (BMSWBI). It contains positive and negative questions to assess an individual's core values, philosophy, and meaning of life in three aspects: tranquility, resistance to disorientation, and resilience. The Spirituality score was calculated by summing question responses (totally disagree = 0, totally agree = 10), with higher scores indicating a greater spiritual well-being. This scale has an alpha coefficient of 0.89 and correlation coefficient of 0.76 in healthy adults.[25]

An investigator-designed questionnaire was used to collect participants' perceptions and practice experiences of the 8-week Qigong exercise program. This questionnaire was reviewed by 3 experienced researchers and revised. It contained 9 open-ended questions that were intended to lead participants to explicate their own beliefs and experiences, perceived benefits, and home practice of Qigong exercise.

Statistical Analyses

Descriptive statistics were used for all questionnaires and the 6MWT distance. The class attendance rate was calculated by the number of sessions attended divided by the number of total sessions. A paired t-test was used to evaluate the change of mean scores of the BBS, HADS, SF-12, spirituality subscale of the BMSWBI, and mean distance of the 6MWT. Since there were 5 outcomes, we controlled for the experiment-wise error rate by using a Bonferroni adjustment. Statistical analyses were performed using SAS software, version 9.3 (SAS Institute, Inc., Cary, NC).

RESULTS

Eighty-eight older adults were screened and deemed eligible for possible recruitment (Figure 2). A total of 45 older adults were enrolled into 3 separate Qigong exercise groups. Twelve participants dropped out after assignment, including 4 that never started the class. A total of 33 participants were evaluable for the follow-up assessment at 8 weeks (84.6% retention). There were no significant differences on demographics, physical activity, health characteristics, or baseline outcome measurements between dropouts and non-dropouts.

Baseline Characteristics of the Participants

The mean age of 45 participants was 74.8±6.57 years and ages ranged from 65 to 86 years. The majority of participants were retired (91%), white (91%), female (84%), and had at least a college-level education (64%) (Table 2). A history of hypertension (38%) and osteoarthritis (36%) were the most common medical conditions. Approximately 32% of participants engaged in less than 60 minutes of physical activity weekly, and of those, all but two reported a mild or moderate intensity level of exercise.

Class Adherence

The participants who completed the study attended on average 13 of 16 Qigong exercise sessions (79%). The most common reasons for absence were holiday travel, babysitting grandchildren, and doctors' appointments. All participants were able to follow the instructor to complete 8 movements by the fourth week of the intervention. Approximately 94%

performed Qigong exercise at least once a week outside the class, with 53% reporting once, 19% twice, and 22% reporting at least three times. Participants reported that the beneficial effects of Qigong exercise contributed to their adherence at home. Detailed adherence data will be published elsewhere (in press).[26]

Physical and Psychological Effects and Spirituality

Physical ability and psychological health of the participants significantly improved after the 8-week intervention (Table 3). The mean distance of the 6MWT improved by a mean of 69 meters ($p < 0.001$). Functional health showed significant improvement from the baseline ($p = 0.001$); the physical component summary score was significantly better ($p = 0.004$). Although there was no significant difference in mental health, a trend toward improvement was evident ($p = 0.070$). Balance and length of arm reach significantly improved ($p < 0.001$). Depression ($p = 0.005$) and spiritual well-being ($p = 0.004$) also significantly improved from baseline. Perceived benefits of Qigong exercise in physical ability and psychological health will be published elsewhere (in press).[26]

DISCUSSION

This study revealed that an 8-week Qigong exercise program was feasible and demonstrated potential to improve physical ability, functional health, balance, psychological health, and spirituality in community-dwelling older adults.

The attrition rate of this study is similar to previous Qigong studies, which reported retention rates from 80% to 92%.[27,28] The class attendance rate of this study (79%) is similar to previous Tai chi and Qigong studies, which have ranged from 74% to 100%.[29] The present study also revealed that the perceived beneficial effects contributed to attendance rates, which is similar to the reported association of positive views and better participation and compliance with Qigong exercise.[30]

Physical ability is important for independence in daily performance.[31] This study demonstrated that Qigong exercise can be useful to enhance the physical ability of older adults.

The mean distance of the 6MWT improved by 69 meters, which was very close to the clinically significant level of 70 meters for patients, and was comparable with previous research.[30,32] Conversely, Astin et al.[33] examined the efficacy of a 24-week Qigong exercise intervention on physical ability in patients with fibromyalgia, a disorder characterized by musculoskeletal pain, and found no significant differences on the 6MWT. The differences in the medical illness may account for the conflicting results.

Although Qigong exercise is a low-impact exercise, its benefits are comparable with aerobic exercise.[34] The mean change in the 6MWT in the current study is greater than what was reported in the pulmonary rehabilitation group[30] and in the aerobic exercise group in previous studies.[35] Although no aerobic exercise group served as a control group in the present study, the greater mean change in the 6MWT is suggestive of what would be expected from aerobic exercise programs. It is worth comparing the effects of Qigong exercise and aerobic exercise on physical ability in future research, in particular, in frail populations.

The scores of the SF-12 were significantly improved from baseline after the intervention, which is consistent with other research that has revealed that Qigong exercise can lead to better functional health.[36,37] Better functional health is strongly associated with muscle strength and lower extremity function.[38] Several movements of Health Qigong require participants to maintain a standing position with bended knees (horse stand), which may potentially strengthen the muscles and function of the lower extremities and result in better functional health. Although the present study used a self-report questionnaire to assess functional health, some participants stated on the questionnaire that they felt that their walking was better and their ability to go up and down stairs improved.[26]

The improved balance observed in this study may be a result of the inherent training features of Qigong movements. Some of Qigong movements in this intervention require participants to bounce on their toes and maintain a horse stand. Bouncing on the toes may strengthen the ankle plantar flexors, as this movement is very similar to the heel raise exercise

that is used to improve ankle plantar flexors' strength and power.[39] The horse stand may be able to train the muscles and strengthen the lower extremities, and stretch the gastrocnemius muscle to increase the ankle's range of motion.[39] Menz, Morris, and Lord studied 186 older adults with a mean age of 80.1 years and found that ankle flexibility and the strength of the ankle plantar flexors significantly affected balance and functional health.[40] This may explain why practicing Qigong can result in better balance. Participants' responses on the questionnaire indicated that they felt that their feet became stronger because of bouncing on their toes and practicing the horse stand.[26] Their responses support the capability of these movements in strengthening the ankle plantar flexors and increasing ankle flexibility, which are factors in balance.

Functional reach is a reliable measure of an older adult's balance[41]; however, functional reach declines with age.[41] The maximal arm forward reach distance (functional reach) increased by approximately 6 centimeters after the intervention in our study. The anterior limit of base of support determines an individual's maximum forward reach distance, and ankle plantar flexors' strength is the key to increase the anterior limit of base of support.[41,42] The present study shows that Health Qigong exercise may improve the functional reach of older adults by strengthening their ankle plantar flexors, affecting the anterior limit of base of support. Yet, research that investigates the relationship and mechanism between older adults' functional reach and the body movements of Qigong exercise is scarce. Only one study found that Qigong exercise increased the base of support in older adults.[43]

The significant improvements in depression found in this study were in agreement with a previous study conducted in China.[44] Improved psychological health may be linked to the regulation of emotional process and affective control. Research has revealed that meditation reduces habitual responding and this reaction may induce a reduction in emotionally reactive behavior, which may have implications for emotional process and affective control.[45-47] Some participants reported that they were happier and had a peaceful mind after the Qigong exercise

intervention, which may be related to the function of meditation in regulating the emotional process and affective control.[26]

Another explanation for improved psychological health is that meditation can evoke the relaxation response.[48] This response has been shown to be effective in stress reduction and lead to improvements in depression.[49,50] A meta-analysis reported that the effects of meditation on depression were comparable to the use of antidepressants in patients with mild to moderate depressive symptoms.[50] Participants in the present study often reported calming and relaxing feelings from Qigong exercise[26], which echoes the relaxation effect of meditation previously reported.

Furthermore, meditation and group activity may promote a sense of spirituality. Participants in this study performed meditation while exercising their bodies in a small exercise group. Buttle[51] proposed that the role of meditation should be considered in the context of spirituality, as people who participated in meditation were more likely to have a greater perception of spirituality. Several studies suggest that group activities can promote spiritual well-being, and spiritual well-being may positively influence older adults' psychological and physical health.[52,53]

A sense of inner peace, "feeling of connecting to wild nature", "fabulous meditative state", and "feeling rejuvenated" are descriptions reported by study's participants[26], which are similar to what was previously reported.[15] No studies were found that examined the effect of Qigong exercise on spiritual well-being in older adults. The Layers Model used as the framework for this study, included spirituality.[15] The spirituality effect revealed in this study is in line with the descriptions of the Layers Model and can be added to the body of alternative exercise literature to inform the spirituality effect of Qigong exercise in older populations.

Our study suggests that further research is required to investigate the effects of Qigong exercise on postural changes, ankle plantar flexor strength, ankle flexibility, and lower extremity muscle strength to uncover the mechanism of Qigong exercise movements on balance

improvement as well as to understand the effect of Qigong on psychological health and spiritual well-being including inner peace, feelings of rejuvenation, feeling connected to nature and spirituality.

This study has limitations. First, it lacked a control group. As the aim of the study was to determine feasibility, we did not include the control group. Next, sample size is small although sample size was calculated based on a moderate effect size. Nonetheless, results of our study can be useful to design a robust randomized control trial with appropriate power. Despite these limitations, this study is unique compared with previous Qigong studies. We believe that this is the first study that explored the effect of Qigong exercise on spiritual well-being in community-dwelling older adults; while most previous studies reported the potential benefits of Qigong exercise on physical ability and psychological health.

In conclusion, a Qigong intervention is feasible in community-dwelling older adults. Qigong exercise may be an additional option for older adults given its low impact on the musculoskeletal system and demonstrated favorable effects on physical ability, psychological health, and spiritual well-being.

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Table 1

Strategies for Intervention Fidelity

Areas	Strategy
Intervention delivery	Direct observation of randomly selected sessions Corrections of any observed problems in delivery of intervention Documentation of classes and hours taught
Intervention receipt	Direct observation of randomly selected sessions Completion of participant sign-up sheets Documentation of participants' performance of Qigong exercise Weekly informal discussion with participants
Enactment	Weekly informal interviews with participants about home practice

Table 2

Baseline Characteristics of Participants (N = 45)

Characteristic	n	%
Age		
65-74	22	48.9%
75-80	11	24.4%
≥ 81	12	26.7%
Gender		
Female	38	84.4%
Male	7	15.6%
Race		
White	41	91.1%
Black	2	4.4%
Asian	2	4.4%
Education completed		
Primary	1	2.2%
High school	9	20.0%
Technical school	6	13.3%
College	20	44.4%
Graduate school	9	20.0%
Marital status		
Married	22	48.9%
Divorced/separated	11	24.4%
Widowed	10	22.2%
Never married	2	4.4%
Home life		
Living with spouse	22	48.9%
Living alone	17	37.8%
Living with other family members	4	8.9%
Living with significant other	2	4.4%
Physical activity		
< 60 minutes/week	14	31.1%
60 – 239 minutes/week	31	68.9%
Self-report exercise intensity		
Mild	21	46.7%
Moderate	22	48.9%
Moderate to intense	2	4.4%
Employment status		
Full-time	1	2.3%
Part-time	1	2.3%
Homemaker	1	2.3%
Temporarily not employed	1	2.3%
Retired	40	90.9%
Annual income		
<$20,000	6	13.3%
$20,000 – $40,000	15	33.3%
$40,000 – $60,000	7	15.6%
>$60,000	9	20.0%
Not available	8	17.8%
Medical history		
Hypertension	17	37.8%
Osteoarthritis	16	35.6%
Cardiovascular disease	9	20.0%
Hyperlipidemia	7	15.6%

Table 3

Effects of Health Qigong Exercise: Comparison of Before and After Values Using Paired t-Test (N = 33)

Outcome Measures	Before Mean±SD	After Mean±SD	Before – After Qigong Exercise (Week 0 – Week 8) Mean difference from baseline (95% CI of mean difference)	t Value*	p Value**
Physical ability (6MWT) (m)	371.1±86.9	440.7±97.8	-69.0±66.1 (-92.47, -45.58)	-6.00	<0.001
HADS	7.6±4.3	5.7±5.1	2.0±3.8 (0.64, 3.30)	3.01	0.005
Depression	2.9±2.1	1.9±2.0	1.0±1.8 (0.32, 1.82)	3.05	0.005
Anxiety	4.7±2.8	3.7±3.4	1.0±2.6 (0.75, 1.93)	2.20	0.035
Functional ability (SF-12)	94.9±12.8	102.0±11.2	-7.1±10.9 (-10.96, -3.20)	-3.72	0.001
Physical component summary	41.7±10.9	45.9±9.5	-4.27±8.0 (-7.09, -1.45)	-3.09	0.004
Mental component summary	53.2±7.5	56.1±6.2	-2.8±8.6 (-5.86, 0.24)	-1.88	0.070
Spirituality (Spirituality subscale of the BMSWI)	101.9±19.7	109.8±20.1	-8.7±16.2 (-14.40, -2.93)	-3.08	0.004
Balance (BBS)	51.1±4.2	53.0±3.1	-1.9±2.2 (-2.66, -1.10)	-4.90	<0.001
Length of arm reach out (cm)	19.8±7.4	25.6±5.1	-5.8±6.3 (-8.02, -3.56)	-5.28	<0.001

Note. 6MWT=6 Minute Walk Test; m=meters; HADS=Hospital Anxiety and Depression Scale (range:0-42); SF-12=Short Form-12 Health Survey; BMSWI=Body-Mind-Spirit Well-Being Inventory (range:0-130); BBS=Berg Balance Scale (range:0-56); cm=centimeters.
*Degrees of freedom = 32 for all
** Using an alpha of 0.01 after Bonferroni adjustment