Published in final edited form as:

West J Nurs Res. 2021 June ; 43(6): 551–562. doi:10.1177/0193945920959067.

Effects of Qigong exercise on physical and psychological health among African Americans

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Abstract

Interventions are needed to address physical and psychological health in middle-aged and older African Americans (AAs). The purpose of this pilot study was to evaluate the feasibility and potential benefits of an 8-week Qigong exercise on physical ability and function, balance, frailty, depression and anxiety, and spiritual well-being in AAs using a single group design. Fifteen AAs with a mean age of 64.0 years received Qigong exercise over 16 semi-weekly, one-hour sessions. The majority were female (93.3%) and college-level educated (53.3%). Repeat chair stands, physical function, and spiritual well-being improved significantly ($p<0.05$) with effect sizes ranging from 0.45 to 0.87. Over 52% of participants showed improved depression scores, fast gait speed, and standing balance. Nearly 42% demonstrated some frailty improvement over baseline. No adverse events were reported. Qigong exercise potentially improves the physical ability and function, and spiritual well-being of AAs and needs further testing in a randomized clinical trial.

Keywords

Qigong exercise; African American; physical ability; physical function; spiritual well-being

Aged racial and ethnic minority populations are more likely to experience frailty in late life and premature morbidity over the course of life (Bandeen-Roche elt al., 2015; Hill et al., 2015). Frailty, which is highly associated with disability, is 65–85% more prevalent in African Americans (AAs) than whites (Bandeen-Roche elt al., 2015). Middle-aged and older AAs often report physical disability and poorer physical function compared to either whites or Asians (Centers for Disease Control and Prevention 2018 Data Finder). Poor physical ability and function may prevent AAs from engaging in healthy behaviors, such as routine physical activity (Gothe & Kendall, 2016). Related to physical ability, balance difficulty increases as adults age (Dillon, Gu, Hoffman, & Ko, 2010). When balance is impaired, the

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Declaration of Conflicting Interests: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

risk for falls and fall-related injuries increases, deteriorating functional independence (Safa et al., 2016). As a result, quality of life becomes compromised (Hartholt et al., 2011). Therefore, early interventions are imperative for promoting healthy outcomes and quality of life in AAs.

Although AAs aged ≥ 50 years experience mental distress more frequently than whites (Cunningham et al., 2017), it is recognized less frequently (Pickett et al., 2013; S. M. Ng et al., 2014). Due to loss of interest and motivation (Rosqvist et al., 2009), depression and anxiety can prevent engaging in a healthy lifestyle (e.g., exercising), which in turn leads to increased morbidity, functional limitations, and greater healthcare utilization (Alexopoulos, 2005; Blazer, 2003; El-Gabalawy et al., 2011; Katon et al., 2003). However, spiritual well-being is associated with fewer depressive symptoms and moderates the influence of frailty on psychological health (Koenig et al., 2004). Evidence suggests that group activities and meditation can promote spiritual well-being (Chang, Knobf, Oh, & Funk, 2018; Kirby et al., 2004; Lawler-Row & Elliott, 2009). AA women report that group activities with their friends or family in their churches promote and maintain their active lifestyles (Eyler et al., 2003; Sbrocco et al., 2005).

Qigong, a Chinese traditional medicine exercise usually practiced as a group in Asia, consists of breathing exercises, meditation, and movements. The theory of Chinese traditional medicine proposes that the body is a small universe where there is a vital energy flow called “Qi,” which sustains the health of the body. Disturbance of vital energy flow results in illness or occurs because of injuries or illness. Qigong exercise has been used to restore the harmony of the vital energy flow to maintain and promote health for thousands of years in Asia. It requires minimal musculoskeletal strain and less energy expenditure (Chan et al., 2012; Hong et al., 2000) and has beneficial effects on physical ability, physical function, balance, and psychological health (Jahnke et al., 2010; Xiao et al., 2016; Zou et al., 2018). Thus, Qigong exercise may offer a good approach for promoting the health of adults with various levels of physical ability, physical function, and chronic illness. Qigong exercise is feasible and acceptable in Americans aged 65 to 85 years and shows promising physical, psychological, and spiritual well-being outcomes with medium effect sizes (Chang, Knobf, Oh, & Funk, 2018; Chang, Knobf, Funk, & Oh, 2018). However, there are no known studies that have tested its effects on frailty, balance, psychological health, and spiritual well-being in AAs. In addition, there is a fundamental gap in understanding the mechanism of how Qigong exercise affects the physical ability and physical function of middle-aged and older AAs.

Purpose

Qigong exercise is innovative in this population, given that no known Qigong studies have targeted community-dwelling middle-aged and older AAs in an urban city. Pilot studies are required prior to full-scale efficacy or effectiveness testing of Qigong. The primary purpose of this single group pre-test/post-test study was to explore the potential benefits of Qigong exercise and the feasibility of implementing Qigong exercise intervention. The Layers Model, which describes the multidimensional benefits of Qigong exercise on physical, mental, and spiritual dimensions, was used to guide the outcome measures (Yang et al.,

2011). Hypothesized benefits were increased physical ability and balance, improved physical function and frailty, reduced depression and anxiety, and improved spiritual well-being. The secondary purpose was to use the dual-energy x-ray absorptiometry (DXA) to examine how Qigong exercise affects the musculoskeletal system associated with physical ability and physical function. Given that this is the first study to use DXA to examine the musculoskeletal effects of Qigong exercise, this study has the ability to identify potential imaging biomarkers that could be used in future Qigong studies.

Method

Design, Setting and Sample

A single-group pretest-posttest design was used to explore the feasibility and potential benefits of an eight-week Qigong exercise intervention. The university's institutional review boards approved the study protocol. The study was conducted in the Midwest. A total of 17 AAs were recruited from January to August of 2019. Inclusion criteria were 1) age 45–85 years, 2) English-speaking, 3) medically stable (not admitted to the hospital emergency department in the three months prior to the study), 4) Mini-Mental State Examination (MMSE) score of ≥ 25, and 5) able to complete questionnaires. People were excluded if they had 1) unstable cardiovascular disease in the last six months, 2) major psychiatric illness, 3) a history of regular Qigong or Tai chi (either once a week or more in the last six months or current participation, or 4) severe bone, joint, or other health conditions limiting exercise training.

Sample Size

A paired t-test, assuming 90% power, alpha of 0.05, an effect size of 1.0, and a two-tailed test of significance, was used to determine the sample size based on a previous study conducted in an older white population (Chang, Knobf, Oh, & Funk, 2018). The sample size needed to detect significant differences in physical ability was 12. Seventeen people were recruited to allow for more than a 25% attrition rate (Chang, Knobf, Oh, & Funk, 2018).

Procedure

A newsletter and announcements from volunteer church leaders were used to recruit AA participants. Those who were interested contacted the principal investigator via email or telephone. Trained research assistants scheduled and met with interested individuals in a conference room at the church for eligibility screening.

All eligible AAs were fully informed about the study procedures in person. Informed consent, demographic, and baseline data were collected, along with preferred days of the week for the Qigong exercise. Participants self-reported responses to the written questionnaires in a conference room at the church. They were informed that research staff would remain available to answer their questions about the questionnaires. Participants also completed physical function tests and the dual-energy x-ray absorptiometry (DXA) scan at a professional lab at baseline and 8 weeks after the Qigong exercise intervention ended. Physical function tests required 30–45 minutes to complete, which included the 6-minute

walk test, gait speed, repeat chair stands, and standing balance. Participants also took 5 minutes to complete 3 short questionnaires and 20 minutes for the DXA scan.

Intervention

Following the baseline assessment, participants attended a one-hour group Qigong exercise class, led by a certified Qigong instructor, with musical accompaniment, twice weekly, for eight weeks (a total of 16 sessions) in an activity center of the church. The Qigong exercise (Baduanjin) consisted of 8 gentle upper and lower body movements, a breathing exercise, and meditation. This form of Qigong exercise was selected as it has no challenging movements to perform and is suitable for beginners and older adults (Chang, Knobf, Oh, & Funk, 2018). Participants were instructed to exercise through eight movements in a standing position at a range within their comfort zone and use movements to guide their breathing patterns. Each session began with a 5-minute warm-up, followed by 40 minutes of Qigong exercise, and concluded with a 5-minute relaxation. Participants were given a 10-minute break during each session. They were encouraged to practice Qigong exercises at home using a 12-minute video that could be accessed online or with a DVD. Research assistants telephoned participants weekly to record participants' frequency of performing Qigong and any additional physical activities at home, using the 7-Day Physical Activity Recall. Intervention fidelity strategies included documenting classes and the number of hours taught and auditing randomly selected class video recordings.

Measures

Sample characteristics were collected using a self-report instrument. Age, gender, education, marital status, social-economic status, medical conditions, self-reported weekly physical activity (minutes and intensity level), and home living status were obtained.

Physical ability and balance were assessed by the well-known and well-validated 6-minute walk test (6MWT) (Guyatt et al., 1985; Kervio, 2003; Troosters et al., 1999) and the short physical performance battery (SPPB; Gomez et al., 2013; Olsen & Bergland, 2017). 6MWT measures the distance walked in 6 minutes, with greater distance indicating better physical ability. The SPPB includes gait speed, repeat chair stands, and a standing balance test for assessing lower extremity functioning. Scores range from 0–12, with higher scores indicating better physical performance. A score ≤ 10 indicates mobility limitations (Vasunilashorn et al., 2009) and is predictive of all-cause mortality (Pavasini et al., 2016).

Physical function was estimated using the physical function (PF) domains of SF-36 and the NIH Patient-Reported Outcomes Measurement Information System computerized adaptive test (PROMIS-CAT). The SF-36 PF asks about limitations on 10 mobility activities. It has good internal consistency and is predictive of physical performance and mortality in different disease states (De Buyser et al., 2013; Kutner et al., 2015; Sehl et al., 2013; Syddall et al., 2009; Wood et al., 2016). The PROMIS-CAT-PF consists of an item bank (121 items in the adult bank) that assesses patient ability on a continuum of function from extremely low to very high. The CAT uses the patient's response to guide the system's choice of subsequent items, resulting in the delivery of only 4 to 6 items from the full item bank. For musculoskeletal conditions, the PROMIS-CAT-PF is valid and reliable and has been found to

have smaller ceiling and floor effects compared to the SF-36 PF (Bartlett et al., 2015; Brodke et al., 2016; Brodke et al., 2017; Jensen et al., 2015).

Frailty status was evaluated by the Frailty Index for Elders (FIFE). It has 10 items with total scores ranging from 0–10: A score of 0 is no frailty, 1–3 for frailty risk, or ≥ 4 for frailty. The validity of the FIFE has been established in older adults with multiple health issues (Tocchi et al., 2014).

Musculoskeletal health was assessed by DXA (Norland Elite; Norland at Swissray, Fort Atkinson, WI). DXA assesses whole body, hip and spine bone mass and density, and whole-body composition (including lean and fat mass). Standardized testing and analysis protocols were used. The short-term precision for our procedure on 15 individuals scanned with repositioning showed root mean square coefficients of variation of <1% for bone mineral density at each site, and 1.2% and 3.0% for whole-body lean and fat mass, respectively.

Psychological well-being was assessed by the Hospital Anxiety and Depression scale (HADS). It has two seven-item subscales: Anxiety (HADS-A) and Depression (HADS-D). Higher scores indicate greater levels of depression and anxiety (Spinhoven et al., 1997). The cutoff point for depression is 8, where scores of 8 or more indicate depression in older adults (Upadhyaya & Stanley, 1997).

Spiritual well-being was evaluated by a subscale of the Body-Mind-Spirit Well-Being Inventory. This subscale assesses participants' core values, philosophy, and meaning of life in three aspects: tranquility, resistance to disorientation, and resilience (S. M. Ng et al., 2005). Higher scores indicate greater spiritual well-being.

Participants' perceptions of and practice experiences with the 8-week Qigong exercise intervention were collected using the Qigong Intervention questionnaire. It prompts participants to explain their own beliefs and experiences, perceived benefits, and home practice of Qigong exercise.

Statistical Analysis

Parameters for all measures were extracted into a Microsoft Excel spreadsheet. Seven missing data were excluded from data analysis. The individual class attendance rate was calculated by the number of attended sessions divided by the total sessions. The retention rate was calculated by the number of participants who completed the follow-up data collection divided by the total number of participants enrolled at baseline. Descriptive statistics were used for all obtained data. Differences for all measures were tested for normal distribution using the Wilcoxon test. The nonparametric Sign test was used if a normal distribution was noted; otherwise, a paired t-test was used. All tests were conducted with a two-sided alternative hypothesis with an alpha = 0.05 significance level. The effect size was estimated using Cohen's D formula of mean difference divided by the standard deviation of the difference. To generate confidence intervals for the effect size, two thousand bootstrap samples were obtained by sampling the data with replacement and calculating the effect size for each sample. The 2.5th percentile and the 97.5th percentile of the resulting effect sizes

were used as the lower and upper limits of the confidence interval. The percent improved from baseline was calculated for each measure.

Results

Twenty-six middle-aged and older AAs from a local church expressed interest in the study (Figure 1). Nine were excluded before enrollment. A total of 17 participants agreed to participate and signed the consents. However, after completing the baseline data collection, one never started the class due to a medical issue, and one never started due to scheduling conflicts; both were excluded from data analysis. A total of 15 participants completed the follow-up assessment at 8 weeks (88.2% retention). The average length of time for completing data collection was 120 minutes per participant (two 60-minute appointments) at baseline and 95 minutes at follow-up tests (one 45-minute and one 50-minute appointment).

Demographic Characteristics

Table 1 displays the demographic characteristics of participants. The mean age of the 15 participants was 64.0 ± 10 years, and ages ranged from 48 to 82 years. The majority were female (93.3%), employed (53.3%), living with other family members (40.0%), and college-educated (53.3%). The most common medical condition was hypertension (73.3%), followed by diabetes (46.7%) and hyperlipidemia (33.3%). The mean length of weekly physical activities was 116 ± 117 minutes. Forty percent of participants engaged in less than 60 minutes of weekly physical activity, and four participants reported no regular physical activity at all. Only 6.7 % had an intensive level of exercise weekly.

Class Adherence

Participants who completed the intervention attended, on average, 10 of 16 Qigong exercise sessions (62.5%); 8 out of 15 (53.3%) completed at least 8 sessions. Attendance rates ranged from 25% to 93.8%. The most common reasons for absence were conflicts with church events, family commitments, sickness, and holiday travels. All participants reported confidence to complete 8 movements with minimum guidance from the Qigong instructors between the fifth and sixth weeks of the intervention. Approximately 86.7% performed Qigong exercise at least once a week outside the class, with 13% reporting once, 46.7% twice, and 26.7% reporting at least three times. Participants indicated beneficial effects of the Qigong exercise (e.g., calming feelings and relaxation) contributed to their adherence at home.

Physical Ability and Physical Function

In terms of physical ability and physical function, repeat chair stands, physical mobility, and physical function of PROMIS significantly improved after the 8-week Qigong intervention with effect sizes ranging from 0.45 to 0.66 (Table 2). The mean number of repeat chair stands improved by nearly 3 times from the baseline ($p = 0.028$). Physical mobility ($p = 0.004$) and physical function were significantly better after the intervention ($p = 0.013$). Despite that, the 6MWT, fast gait speed, SPPB total scores, and physical component of SF-36 did not reach significance level. However, 70.6% and 41.2% of participants showed

improvements in fast gait speed and SPPB scores, respectively (Table 3). The improvement of SPPB was significantly greater than 50% from baseline (Table 3).

Balance and Frailty Status

Approximately 53% of participants demonstrated a trend toward improvement in both center of gravity (COG) path and area of standing balance test. While there were no significant differences in the frailty index and standing balance test, the mean scores of the frailty index decreased slightly compared with the baseline (Table 2), and 41.2% of participants showed improved frailty scores (Table 3).

Musculoskeletal Health

There was no significant increase in total lean mass and total BMC after the intervention. Approximately 29% and 47% of participants had increased total lean mass (g) and total BMC, respectively, since the baseline (Table 3). Although total fat (g) significantly increased ($p < 0.001$) after the intervention (Table 2), 24% of participants showed total fat (g) decreased after the 8-week Qigong exercise.

Psychological Health and Spiritual Well-being

Depression and anxiety results provided mixed signals. While the mean scores in depression decreased 0.73 with an effect size of 0.43, and anxiety scores increased slightly, neither of these were statistically significant (Table 2). About 65% of participants showed improvement in depression scores, and 35% had improved anxiety scores compared with the baseline (Table 3). Additionally, despite the small sample size, we observed strong positive increases in spiritual well-being ($p = 0.005$), with an effect size of 0.87, including resilience ($p = 0.039$) after the intervention (Table 2). Spiritual well-being also had the largest effect size compared to other outcomes. Nearly 71% of participants showed improved spiritual well-being scores, including 59% for improved resilience (Table 3).

Discussion

The findings show that Qigong exercise is feasible in community-dwelling middle-aged and older AAs and has the potential to improve physical ability, physical function, spiritual well-being, and resilience. This is the first Qigong study to explore the use of DXA to understand the mechanisms by which Qigong exercise affects physical ability and physical function. Although the DXA did not demonstrate any statistical improvements in whole-body composition and bone mass in our pilot study, total BMC increased slightly. Moreover, the objective physical test results, such as repeated chair stands and PROMIS-CAT-PF, showed promising effects on muscle strength of the lower legs and physical function in middle-aged and older AAs after an 8-week Qigong exercise.

Our study had a retention rate of 88.2%, which is similar to rates (between 84 to 93%) reported previously in white and Asian populations (Chang, Knobf, Oh, & Funk, 2018; Xiao & Zhuang, 2015). Each participant attended an average of 10 out of 16 sessions (62.5%), which is fewer than what was reported before (> 74%) (Chang, Knobf, Oh, & Funk, 2018; B. H. P. Ng et al., 2014). Consistent with previous studies, the perceived benefits, such as

relaxation and calming feelings, contributed to adherence to home practice and the retention rate of this study (Chang, Knobf, Funk, & Oh, 2018). The perceived sense of relaxation and calm, perhaps provoked by the slow movement and meditation components of Qigong exercise (Zou et al., 2018), may lead to stress relief (Goyal et al., 2014). In a previous study, stress relief was correlated with exercise adherence in AA women (Kang et al., 2018). The high retention rate of our study and exercise adherence outside of the class (86.7%) also might support that steady-state and moderate exercise training, such as Qigong, is more enjoyable than high-intensity exercise (Foster et al., 2015). However, higher attendance rates would be optimal in future studies. Preventing scheduling conflicts with major holiday and church events (i.e., summer break), giving certificates to participants who attend the most classes, and identifying participants who may be interested in assisting with reminders to attend classes are strategies that could be implemented in the future.

Unlike in previous studies in older white adults, no significant change was found in the 6MWT after the intervention (Chang, Knobf, Oh, & Funk, 2018; Chang et al., 2019). This may be associated with the wider range of class attendance rates among study participants and the intervention duration. Although high-intensity exercise training is more time-efficient, the aerobic effects are equivalent regardless of high or moderately intense exercise training (Zou, Sasaki, et al., 2017). The trend toward improvements in fast gait speed and frailty index demonstrated that participants might gradually gain aerobic effects from practicing Qigong exercise (Table 3). In addition to a better class attendance rate, a longer intervention duration may be needed to produce changes in the 6MWT. A Qigong intervention duration of at least 1,500 to 2,000 minutes was previously suggested for improving the physical ability of older adults (Chang et al., 2019; Zou, Sasaki, et al., 2017). A longer program also would allow middle-aged and older AAs more time to learn and practice the Qigong exercise. Our study participants indicated that an average of five to six weeks was needed to perform the Qigong exercises on their own with minimal guidance from the instructor, which is longer than white participants reported in the previous study (Chang, Knobf, Funk, & Oh, 2018).

Physical ability and physical function are keys to daily performance (Idland et al., 2013). The findings of this study support that Qigong exercise is potentially useful for enhancing physical ability and physical function of middle-aged and older AAs. On average, participants can do 3 more chair stands in 30 seconds after the Qigong intervention. The improved repeat chair stands may be explained by the improved low limb muscle strength that results from inherent training features of Qigong movements, such as bouncing on the toes and holding a horse stance (a standing position with bended knees) (Chang, Knobf, Oh, & Funk, 2018). These two movements may strengthen the ankle plantar flexor and knee flexor. Ankle plantar flexor and knee flexor strength are associated with repeat chair test outcomes, and ankle plantar flexor strength contributes most to the test performance (McCarthy et al., 2004). The strength of the ankle plantar flexor also plays an important role in static balance that stabilizes the body in the upright standing position (McCarthy et al., 2004). The strength of ankle plantar flexor is essential for balance and physical function of older adults (Menz et al., 2005). Although the standing balance test of the present study did not show statistically significant changes, more than 50% of study participants had improved

COG path and area after the intervention. In other words, the improved balance might be expected with a larger sample size.

Considering that significant DXA changes have been reported in several longitudinal intervention studies (e.g., Tai Chi studies), DXA might be a potential tool for providing imaging biomarkers of the musculoskeletal system, which in turn may help researchers understand the mechanisms of Qigong exercise that affect physical ability and physical function (Sun et al., 2016). In this small pilot study, no significant DXA changes were observed due to the short-term follow-up evaluation. However, DXA would be more feasible for long-term Qigong interventions. Other studies have shown that the duration of the intervention and frequency of weekly sessions were important factors (Sun et al., 2016; Zou, Wang, et al. 2017). One year or longer intervention durations are recommended for observable DXA changes because the duration of the bone remodeling cycle is at least 24 weeks (Asikainen et al., 2004; Eriksen, 2010). It was reported that middle-aged and older Asian women who participated in a Tai Chi intervention for more than 3 years, with weekly Tai Chi sessions greater than 5 hours, showed significant changes in DXA outcomes (Qin et al., 2005). In addition to the intervention duration, the type and intensity of the exercise intervention may also play a role in positive DXA changes. Previous studies used aerobic exercise, walking, or resistance training as an intervention, with durations ranging from 8 to 12 weeks in overweight women, sedentary middle-aged workers, sarcopenic-aged women, or AA women with chronic illness or cancer. Significant changes in total BMC, total lean and fat mass, or total lean muscle were detected in those studies with aerobic exercise and resistance training (Boutcher, 2019; Gonzalo-Encabo et al., 2019; Rodriguez-Gomez et al., 2019; van Dongen et al., 2020), though results were less conclusive in AAs (Hornbuckle et al., 2012; Rosa et al., 2018; Spector et al., 2014).

Meditation, Tai Chi, Qigong, and Yoga have been reported as effective measures for depression and anxiety management (Chang, Knobf, Oh, & Funk, 2018; Cramer et al., 2013; Goyal et al., 2014). However, our study findings provided mixed signals. While depression scores improved with a marginally medium effect size, the mean scores of anxiety slightly increased, though neither of these changes were statistically significant. It is worth noting that study participants had a mean depression score far below the cutoff point of 8 at baseline (Table 2). The improved depression scores may be linked to the meditation component of Qigong exercise (Chang, Knobf, Oh, & Funk, 2018; Goyal et al., 2018). Meditation may modify habitual responding in relation to emotional processing and affective control, which induces a reduction in emotionally reactive behavior (Aftanas & Golosheykin, 2005; Lutz et al., 2008; Wenk-Sormaz, 2005). Such changes have implications for emotional processing and affective control. In addition, meditation can evoke a relaxation response that is effective in reduction stress, subsequently resulting in improved psychological health (Bhasin et al., 2013; Goyal et al., 2014; Wallace et al., 1971). The majority of our study participants perceived calming feelings and relaxation after the first Qigong exercise session, which echoes the benefits of meditation practice in psychological health.

No studies have evaluated the effects of Qigong exercise on spiritual well-being in AAs. Although our sample size is small, we observed stronger positive increases for spiritual well-

being than for any other psychological measure in this study, which is in line with previous studies in older whites and Asians (Chang, Knobf, Oh, & Funk, 2018; Yang et al., 2011). This finding supports that meditation practice of Qigong exercise and group activity may promote a sense of spiritual well-being that supports psychological health (Buttle, 2015; Yang et al., 2011). The improved depression scores in our study may support the association between meditation practice, spiritual well-being, and psychological health. In addition to meditation, practicing Qigong exercise in a small group setting provided our study participants with a network of social support that may have enhanced their sense of spiritual well-being (Kirby et al., 2004; Lawler-Row & Elliott, 2009). Unlike the previous studies, our study participants were all church members who regularly attended church activities; therefore, participation in church activities should be taken into account while interpreting the relationship between Qigong exercise and spiritual well-being. According to one study, people who are religious are more likely to diligently adhere to practicing meditation and benefit more from its effects on stress reduction and relaxation, which might mediate spiritual well-being results (Buttle, 2015).

We found that resilience significantly improved in more than 50% of study participants with a moderate effect size after the Qigong intervention. Given that resilience was suggested as a resistance factor for depressive symptoms in aged adults (Smith, 2009), our findings may have powerful implications for promoting health behavior through Qigong exercise in aged, vulnerable, and marginalized populations. A study indicated that older AA adults with resilience might be more proactive in seeking health care support and more willing to discuss psychological issues with their providers (Smith, 2009). It is worth investigating the relationship between meditation practice and resilience-building in future Qigong research.

The potential benefits of Qigong exercise should be interpreted cautiously due to several limitations: 1) the lack of a control group, 2) small sample size, and 3) use of self-reported measurements in spiritual well-being, depression, anxiety, and physical function. Given the primary purpose of this study was to explore the potential benefits of Qigong exercise and determine the feasibility of implementing the Qigong intervention in a community setting for middle-age and older AAs, we did not include a control group and used a small sample size. Although the sample size was small, it was determined based on an effect size reported previously (Chang, Knobf, Oh, & Funk, 2018). Moreover, no data collection quality assurance was in place due to the limited budget. However, video demonstrations and scripts of data collection were provided to research assistants. All data collections, except demography, psychological outcomes, and spiritual well-being, were carried out in a professional lab with standardized procedures. Despite these limitations, this study was the first to explore the potential benefits and feasibility of the Qigong intervention in middle-aged and older AAs. We also included DXA as an outcome measure to understand the changes in participants' muscle and bone mass in order to advance the science of Qigong research. Moreover, this study used reliable and objective measures for physical ability and balance.

The present study demonstrated that middle-aged and older AAs highly accepted the Qigong exercise program and showed the potential benefits of Qigong on physical ability, physical function, psychological health, and spiritual well-being. The Qigong intervention in this

study should be evaluated with a comparison group and a larger sample size. DXA could be considered as the outcome measure for future longitudinal Qigong exercise studies. Moreover, we recommend including objective measures for psychological health, such as cortisol levels, and strategies to improve attendance rates for future Qigong research. Better attendance rates might result in significant positive changes in 6MWT, balance, gait speed, and frailty.

Acknowledgements

The authors thank Drs. Janet Carpenter, Stuart Warden, Kelly Wierenga, Chen Chen, and Jane Rita von Gaudecker for their valuable comments on manuscript development, and St. Rita's Catholic Church for support and assistance with study recruitment.

Funding:

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by Sigma Theta Tau International Alpha Chapter Research Award; Indiana University School of Nursing Ethel Clarke Award; and National Institutes of Health/ National Institute of Arthritis and Musculoskeletal and Skin Disease P30 AR072581.

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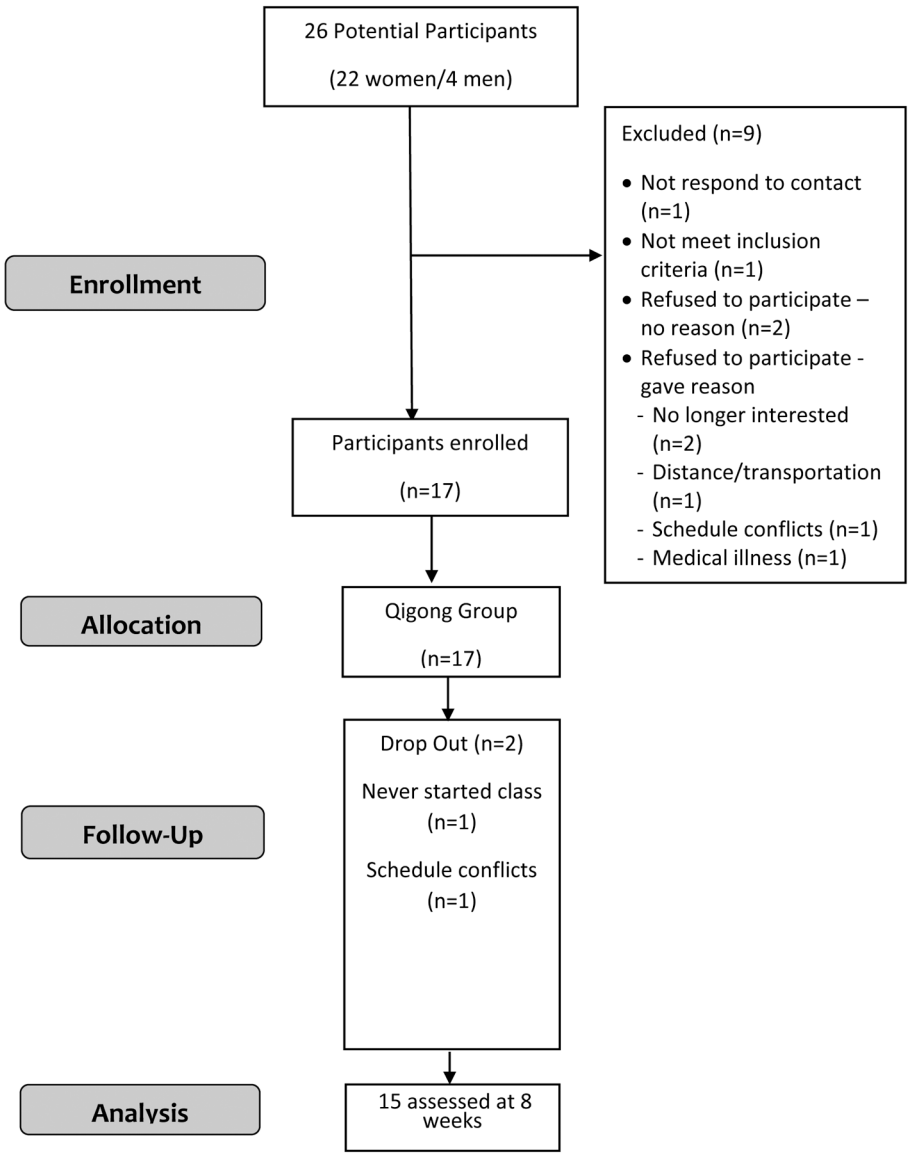

Figure 1.
Flowchart of the participants in the study

Table 1.

Baseline Characteristics of Participants (N=15)

Characteristic	n	%
Age		
45–54	5	33.3%
55–64	1	6.7%
65–74	8	53.3%
≥ 75	1	6.7%
Gender		
Female	14	93.3%
Male	1	6.7%
Education completed		
Technical school	1	6.7%
College	8	53.3%
Graduate school	6	40.0%
Marital status		
Married	2	13.3%
Divorced/separated	4	26.7%
Widowed	6	40.0%
Never married	3	20.0%
Home life		
Living with spouse	4	26.7%
Living alone	5	33.3%
Living with other family members	6	40.0%
Physical activity (minutes/week)		
< 60	6	40.0%
60 – 150	4	26.7%
>150	5	33.3%
Self-report exercise intensity		
Not applicable (no exercise at all)	4	26.7%
Mild	4	26.7%
Moderate	6	40.0%
Intensive	1	6.7%
Employment status		
Full-time	8	53.3%
Retired	7	46.7%
Annual income		
<$20,000	1	6.7%
$20,000 – $40,000	2	13.3%
$40,001 – $60,000	3	20.0%
>$60,000	6	40.0%
Not available	3	20.0%

Characteristic	n	%
Medical history		
Hypertension	11	73.3%
Osteoarthritis	3	20.0%
Cardiovascular disease	1	6.7%
Diabetes	7	46.7%
Hyperlipidemia	5	33.3%

Table 2.

Effects of Qigong Exercise: Comparison of Before and After Values

Outcomes		n	Before Mean ± SD	After Mean ± SD	After - Before Qigong Exercise (Week 8- Week 0) Mean difference (95% CI)	t-Value**	p-Value	Effect Size 95% CI
Physical Ability	6MWT(m)	14	483.3 ± 126.0	482.1 ± 121.1	−1.13 (−32.45, 30.20)	−0.08	0.9391	−0.02 (−0.67, 0.53)
	SPPB scores	15	10.6 ± 2.0	10.3 ± 3.2	−0.33 (−1.62, 0.95)		0.9999	−0.14 (−0.49, 0.56)
	Fast gait speed	14	3.1 ± 2.7	2.3 ± 0.6	−0.78 (−2.19, 0.64)		0.4240	−0.32 (−0.81, −0.03)
	Repeat chair stands	14	11.9 ± 2.7	14.4 ± 5.9	2.57 (0.32, 4.82)	2.47	0.0282	0.66 (0.30, 1.14)
	Standing balance Test-COG path	15	1.0 ± 3.0	0.2 ± 0.1	−0.77 (−2.42, 0.88)		0.9999	−0.26 (−0.56, 0.41)
	Standing balance Test-COG area	15	3.9 ± 3.0	4.0 ± 3.1	0.17 (−2.06, 2.41)	0.16	0.8718	0.04 (−0.56, 0.56)
	PROMIS- CAT-PF mobility[a]	15	44.5 ± 12.7	48.9 ± 7.7	4.32 (−1.01, 9.65)		0.0039	0.45 (0.34, 0.92)
Physical Function	SF-36 PF	15	24.1 ± 6.4	25.0 ± 5.7	0.93 (−1.59, 3.46)		0.7744	0.20 (−0.45, 0.55)
	PROMIS-CAT-PF[a]	15	45.3 ± 11.6	50.3 ± 7.4	4.96 (−0.23, 10.15)		0.0129	0.53 (0.38, 1.29)
Frailty Status	Frailty index	15	1.3 ± 1.3	1.2 ± 1.8	−0.07 (−0.86, 0.73)		0.7266	−0.05 (−0.79, 0.38)
Musculoskeletal health (DXA Scan)	Total fat (%)	14	41.2 ± 9.4	42.1 ± 9.5	0.91 (0.40, 1.41)	3.87	0.0019	1.03 (0.49, 2.40)
	Total fat (g)	14	38767 ± 17986	39869 ± 17907	1101.8 (698.10, 1505.5)	5.90	<.0001	1.58 (0.89, 3.82)
	Total lean (g)	14	49130 ± 8438.7	48779 ± 8363.2	−350.9 (−1118, 415.94)	−0.99	0.3409	−0.26 (−0.86, 0.27)
	Total BMC (g)	14	3041.2 ± 377.4	3056.6 ± 382.9	15.36 (−48.42, 79.14)	0.52	0.6117	0.14 (−0.50, 0.65)
Psychological well-being	HADS (total score)	15	5.0 ± 3.8	4.9 ± 2.7	−0.07 (−1.54, 1.41)	−0.10	0.9240	−0.03 (−0.65, 0.47)
	Depression subscale	15	2.0 ± 1.7	1.3 ± 1.5	−0.73 (−1.68, 0.21)	−1.66	0.1189	−0.43 (−1.11, 0.04)
	Anxiety subscale	15	3.0 ± 2.4	3.7 ± 1.8	0.67 (−0.24, 1.57)	1.58	0.1362	0.41 (−0.08, 1.00)
Spiritual well-being	Total score	15	105.1 ± 15.2	117.7 ± 10.8	12.60 (4.57, 20.63)	3.36	0.0046	0.87 (0.37, 1.77)
	Resilience	15	25.5 ± 4.2	27.2 ± 3.6	1.67 (−0.98, 4.31)		0.0386	0.35 (−0.14, 1.16)

Note. Sign test was used in outcomes without t-value. 6MWT: 6-minute walk test; SPPB: Short Physical Performance Battery; PROMIS-CAT-PF: NIH Patient Reported Outcomes Measurement Information System computerized adaptive test – physical function; BMC: Bone Mineral Content; HADS: Hospital Anxiety and Depression Scale; SF-36 PF: 36-Item Short Form Survey Physical Components; COG: Center of Gravity.

[a] – T scores were used

** - Using an alpha of 0.05

Table 3.

Effects of Qigong Exercise: Percent Improved Compared with Baseline

	Outcomes	Percent Improved	95% Confidence Interval
Physical Ability	6MWT(m): improve change >0	6/17 (35.3%)	(14.2, 61.6)
	SPPB score: improve change >0	4/17 (23.5%)	(6.8, 49.9)
	Fast gait speed: improve change <0	12/17 (70.6%)	(44.0, 89.6)
	Repeat chair stands: improve change >0	10/17 (58.8%)	(32.9, 81.5)
	Standing Balance Test-COG path: improve change<0	9/17 (52.9%)	(27.8, 77.0)
	Standing Balance Test-COG area: improve change<0	9/17 (52.9%)	(27.8, 77.0)
	PROMIS- CAT-PF mobility: improve change >0	9/17 (52.9%)	(27.8, 77.0)
Physical Function	SF36 PF: improve change>0	7/17 (41.2%)	(18.4, 67.0)
	PROMIS-CAT-PF: improve change>0	12/17 (70.6%)	(44.0, 89.6)
Frailty Status	Frailty index: improve change<0	7/17 (41.2%)	(18.4, 67.0)
Musculoskeletal health (DXA Scan)	Total fat (%): improve change <0	6/17 (35.3%)	(14.2, 61.6)
	Total fat (g): improve change<0	4/17 (23.5%)	(6.8, 49.9)
	Total lean (g): improve change>0	5/17 (29.4%)	(10.3, 55.9)
	Total BMC (g): improve change>0	8/17 (47.1%)	(22.9, 72.1)
Psychological well-being	HADS total score: improve change<0	9/17 (52.9%)	(27.8, 77.0)
	HADS Depression: improve change<0	11/17 (64.7%)	(38.3, 85.7)
	HADS Anxiety: improve change<0	6/17 (35.3%)	(14.2, 61.6)
Spiritual well-being	Total score: improve change>0	12/17 (70.6%)	(44.0, 89.6)
	Spiritual well-being Resilience: improve change>0	10/17 (58.8%)	(32.9, 81.5)

Note. 6MWT: 6-minute walk test; SPPB: Short Physical Performance Battery; PROMIS-CAT-PF: NIH Patient Reported Outcomes Measurement Information System computerized adaptive test- physical function; BMC: Bone Mineral Content; HADS: Hospital Anxiety and Depression Scale; SF-36 PF: 36-Item Short Form Survey Physical Components; COG: Center of Gravity.

*2 sided test that proportion improved is different from 50%.