Efficacy of Ba Duan Jin in Improving Balance
A Study in Chinese Community-Dwelling Older Adults

ABSTRACT
The current quasiexperimental study was intended to determine the efficacy of Ba Duan Jin (translation: eight-section brocade) in improving balance ability of Chinese community-dwelling older adults. The trial group (n = 47) engaged in a Ba Duan Jin exercise program for 12 weeks, whereas the control group (n = 48) participated in a 12-week walking exercise program. After the intervention, participants’ balance ability was evaluated using the Timed Up and Go Test (TUGT), One Leg Standing Test (OLST), Berg Balance Scale (BBS), and Modified Falls Efficacy Scale (MFES). Ba Duan Jin was associated with increased TUGT and OLST scores at Week 6 with continuous increases reported through Week 12. Ba Duan Jin was also associated with increased BBS and MFES scores at Week 12. Ba Duan Jin may be an effective means for improving balance ability in Chinese community-dwelling older adults. [Journal of Gerontological Nursing, 42(5), 38-46.]

Falls are defined as unexpected events in which individuals come to rest on the ground, floor, or a lower level (Lamb, Jørstad-Stein, Hauer, & Becker, 2005). Risk factors vary and are both intrinsic and extrinsic. Aging affects the central nervous system (i.e., changes in brain volume) and neuromuscular system properties (i.e., loss of sensory and motor neurons), leading to reductions in balance and gait performance (Granacher, Muehlbauer, & Gruber, 2012). Balance refers to the body’s coordination capacity from the vestibular organs, somatosensory and visual stimuli, and proprioception, as well as the skin and joints (Howe, Rochester, Neil, Skelton, & Ballinger, 2011). Balance is both dynamic and static (Pollock, Durward, Rowe, & Paul, 2000; Yan & Dou, 1999). Static balance is a relatively quiescent state of controlling the center of gravity, whereas dynamic balance is the ability to control the body’s center gravity and adjust posture during movement. Reduction in balance ability leads to increased risk of falls in older adults. A systematic review by Balzer, Bremer, Schramm, Lühmann, and Raspe (2012) showed that multidimensional and long-term exercise programs can be effective for fall prevention. Exercise programs emphasizing balance training have been shown to reduce the rate of falls and risk of falling among older adults (Gillespie et al., 2012; Sherrington et al., 2008). Therefore, exercises that concentrate on balance training may be effective in preventing falls in older adults.

Qigong is a combination of postures, meditation, and movements designed to improve holistic health and facilitate mind-body integration (Jones, 2001; McCaffrey & Fowler, 2003). In traditional Chinese medicine, “Qi” is the most basic element, constituting the human body and maintaining life activities. The movement of Qi throughout the entire body regulates physiological function (Chi, 2012). Qigong Ba Duan Jin (Ba Duan Jin, translation: eight-section brocade) is an ancient Chinese health gymnastics technique. Ba Duan Jin has eight combinations of different body movements, therefore named Ba Duan Jin. Ba means eight, Duan means section, and Jin means brocade (i.e., symbolic of something luxurious). Historical records show Ba Duan Jin has been practiced for more than 800 years. Ba Duan Jin is designed in accordance with

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the theory of the laws of motion and holism (i.e., the human body is regarded as an organic whole) to facilitate integrated Qi movements, and it reflects the theory of traditional Chinese medicine and health concepts.

Ba Duan Jin is a low-intensity aerobic exercise. A complete set comprises eight postures (Figure) in addition to beginning and ending movements. Ba Duan Jin protocol for the current study follows the General Administration of Sport of China (2003), which is the most popular style. A Ba Duan Jin exercise program typically includes three phases: (a) warm-up preparation (1 minute); (b) set of eight movements performed three times (approximately 30 minutes); and (c) relaxation and cool down (2 minutes). The practice methods of Ba Duan Jin include three regulations: (a) body focus, (b) mind focus, and (c) breath focus. The slow, gentle, graceful movements of Ba Duan Jin, combined with meditation, deep breathing, and relaxation, move Qi throughout the body. Current studies have suggested that Ba Duan Jin training appears to have substantive benefits for older adults with physical and mental disorders, such as anxiety, depression, hyperlipidemia, spinal problems, osteoarthritis, and type 2 diabetes (An et al., 2013; Hsu, Wang, Liu, & Liu, 2008; Mei, Chen, Ge, Zheng, & Chen, 2012). Ba Duan Jin has several health effects, and the levels of exercise intensity and simplicity of movements make it suitable for practice among older adults. The purpose of the current study was to assess the efficacy of Ba Duan Jin in improving the balance ability of Chinese community-dwelling older adults.

**METHOD**

**Design**

A quasiexperimental, untreated control group design was used. The study was conducted from February through June 2013. One hundred eight voluntary participants were screened in one community of the Long Quan Yi District, Chengdu City, China. To avoid contamination between the trial and control groups, 54 participants in the trial group were selected from east of the community and were assigned to practice Ba Duan Jin. The control group...
comprised 54 participants from west of the community and were assigned to practice walking. Both groups practiced for 12 weeks. The same health education was given to both groups at Weeks 1, 4, 8, and 12. Data were collected at baseline and Weeks 6 and 12.

Participants
Sample size was determined based on an alpha level of 0.05, with a type I error of 5% (alpha = 0.05) and 90% power (alpha = 0.10). The required minimum sample for the current study was 48 participants for each group. Assuming an attrition rate of 10%, 54 participants were recruited for each group, thus a total of 108 participants were included. Participant inclusion criteria were: age 60 or older; ability to participate in physical exercise; and chronic disease in a stable state (e.g., diabetes, hypertension stabilized by medication). Exclusion criteria were participation in other sports (e.g., Tai Chi, Wu Qin Xi, ballroom dancing) and illness/disease that cannot tolerate physical activity.

After screening, selected participants gave their agreement to take part in the study by signing appropriate consent forms. In the trial group, during the intervention, three participants dropped out due to travel out of Chengdu City and four withdrew due to hospitalization. Therefore, a total of 47 trial group participants completed the study. In the control group, two participants withdrew because of leg pain and four participants switched to other physical activities, thus 48 participants completed the study. The final sample comprised 95 participants.

Intervention
The intervention team included a coach, community director, researcher, and graduate students. The coach, a professional teacher for the traditional health movement, gave a lecture about Ba Duan Jin to the trial group prior to the intervention. Results were collected and evaluated by the researcher and four graduate students at the completion of the study.

Trial group participants (Ba Duan Jin) were given four les-
sons by the researcher on how to prevent falls, diabetes mellitus, and hypertension, and keeping a healthy diet, each lesson lasting 40 minutes. The actual intervention itself was divided into two phases, preintervention (2 weeks) and intervention. In the first preintervention session, the coach explained the theory of Ba Duan Jin and provided participants with printed materials on principles and techniques. In the subsequent sessions, the coach instructed Ba Duan Jin movement two times per week for 2 weeks with a practice time of 30 to 40 minutes, and the remaining time was self-practice for 30 to 40 minutes daily at home following an instructional DVD. The coach was later responsible for correcting the movement in class.

In the intervention phase (12 weeks), participants practiced together for 30 to 40 minutes each day in teams. Participants were required to master Ba Duan Jin movements and strive to master breathing techniques while, at the same time, develop or strengthen styles to improve balance. Examples of these techniques would be the second pose (B), “Draw a bow on both sides, like shooting a vulture”; the fifth pose (E), “Sway head and buttocks to expel heart (Xin)-fire”; and eighth pose (H), “Rise and fall on tip toes to prevent all diseases” (Figure). Safety instructions were given prior to the intervention, such as wearing loose clothing and soft shoes. Each session of Ba Duan Jin included a warm-up at the beginning and self-relaxation at the end of movement to reduce risks of injury. After completion of the 12-week intervention phase, participants were encouraged to maintain their Ba Duan Jin group practice.

The intervention for the control/walking group included the same wellness education as the trial/Ba Duan Jin group. The control group walked for 40 to 60 minutes per day for 12 weeks. Participants were instructed not to participate in other forms of physical activity to ensure the comparability of results. Specific requirements were: daily 40 to 60 minutes of medium-speed walking, twice per week team sessions, and self-practice at other times; appropriate speed was 80 to 90 steps per minute, or the ability to talk while walking. Participants were instructed to dress in loose clothing, wear soft flat shoes, and walk in open areas without barriers.

Outcome Measures and Follow Up

Participant characteristics and socioeconomic data were collected. Timed Up and Go Test (TUGT; Podsiadlo & Richardson, 1991), One Leg Standing Test (OLST; Vellas et al., 1997), Berg Balance Scale (BBS; Bogle, Thorbahn, & Newton, 1996), and Modified Falls Efficacy Scale (MFES; Yardley et al., 2005) were performed before the intervention.

Timed Up and Go Test. The TUGT is a simple, practical, and reliable potential balance ability test, which takes 1 to 2 minutes to complete. This test has shown excellent test/retest reliability (intra-class correlation coefficient [ICC] = 0.99) in older adults (Okumiya et al., 1998; Podsiadlo & Richardson, 1991). A completion time ranging between 20 and 29 seconds indicates a need for additional testing to assess functional activity level. A time >14 seconds to complete the test indicates high risk for falls (Shumway-Cook, Brauer, & Woollacott, 2000). Reports have shown that the TUGT and BBS have a good correlation ($r = –0.72$) (Mancini & Horak, 2010).

One Leg Standing Test. The OLST (with eyes closed) is commonly used for balance assessment of postural stability. The OLST can be used as a predictor of injurious falls (Vellas et al., 1997). The OLST may also prove to be valuable in the assessment of hip fracture risk (Lundin et al., 2014). Participants are instructed to put their hands on their hips, close their eyes, and stand on their dominant foot, with the other foot off the ground. Times are recorded for the duration that the position is held. The OLST is considered to be potentially useful in predicting functional decline and is a marker of frailty (Drusini et al., 2002; Hiroyuki, Uchiyama, & Kakurai, 2003).

Berg Balance Scale. The BBS is used mainly to determine risk factors for loss of independence and falls by older adults. The scale assesses balance in 14 activities of daily living (ADLs). Each item is graded on a Likert scale, ranging from 0 to 4 points, with higher scores indicating higher risk for falls (maximum score = 56 points). The BBS takes approximately 10 to 15 minutes to complete. Bogle Thorbahn and Newton (1996) reported that the BBS has strong intrarater reliability ($r = 0.88$), with a cutoff score of 45 indicating high fall risk. The BBS was tested in a Chinese population, resulting in Cronbach’s alpha of 0.864 and a split-half reliability coefficient of 0.915 (Weng, Wang, & Wang, 2007).

Modified Falls Efficacy Scale. The MFES is modified from the Falls Efficacy Scale (FES), which includes 14 items plus four outdoor activ-
ity items. Internal validity (Cronbach’s alpha = 0.96) and test–retest reliability (ICC = 0.96) have been shown to be excellent (Yardley et al., 2005). The MFES is used to measure the capacity of older adults to complete assigned activities without loss of balance confidence. Each item is graded on a Likert scale, ranging from 0 (no confidence) to 10 (full confidence) points. The MFES has been translated into Chinese and its reliability and validity have been tested in hospitals and communities (Cronbach’s alpha = 0.9774; content validity ICC = 0.637 to 0.926 [Hao & Liu, 2007]).

### Data Collection Procedures

Baseline data for the trial group were collected before commencement of the Ba Duan Jin exercise. Baseline data for the control group were collected before initiation of the walking regimen. Participants performed the TUGT and OLST at baseline and Weeks 6 and 12 after the intervention. The BBS and MFES were performed at baseline and Week 12 after the intervention.

### Data Analysis

Study data were analyzed using SPSS (version 19). Chi-square tests, Fisher’s exact tests, and independent $t$ tests were used to compare differences in participant characteristics and socioeconomic status between the two groups. A group $t$ test was used to compare data between groups. For data collected at different time points, repeated measures analysis of variance (ANOVA) was used to compare between-group and within-group differences. The significance level was alpha = 0.05.

### RESULTS

Preliminary analysis was conducted to assess the equivalence between the trial and control groups in regard to all participant characteristics and socioeconomic status. No significant differences were found between groups (Table 1).

Differences were noted between the trial and control groups in regard to the TUGT and OLST (Table 2). The average time of the TUGT among trial group participants was significantly lower than that of the control group at Weeks 6 and 12. The average time of the OLST among trial group participants was significantly higher than that of the control group at Weeks 6 and 12. Repeated measures ANOVA showed statistically significant group and time effects (Table 3).

TUGT and OLST times were also compared between baseline and Week 6 and baseline and Week 12 within both groups (Table 2). In the trial group, TUGT times at Weeks 6 and 12 were both significantly lower than those at baseline. OLST times at Weeks 6 and 12 were both significantly higher than those at baseline. In the control group, TUGT time at Week 6 was only slightly lower than baseline ($p = 0.046$), but significantly lower than times at baseline and Week 12 ($p < 0.001$). OLST times between baseline and Week 6 showed no significant difference. However, the OLST time at Week 12 was significantly lower than baseline.

After the intervention, between-group comparison showed that the

### Table 1

**STUDY PARTICIPANT DEMOGRAPHICS (N = 95)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group (n = 48)</th>
<th>Trial Group (n = 47)</th>
<th>t Test/Chi-Square Test</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>37 (77.1)</td>
<td>38 (80.9)</td>
<td>0.203$^a$</td>
<td>0.802</td>
</tr>
<tr>
<td>Male</td>
<td>11 (22.9)</td>
<td>9 (19.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td>0.386$^a$</td>
<td>0.575</td>
</tr>
<tr>
<td>Middle school or less</td>
<td>42 (87.5)</td>
<td>39 (83)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>6 (12.5)</td>
<td>8 (17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td>0.674$^a$</td>
<td>0.425</td>
</tr>
<tr>
<td>Military factory worker</td>
<td>40 (83.3)</td>
<td>36 (76.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher/technician</td>
<td>8 (16.7)</td>
<td>11 (23.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td>1.036$^a$</td>
<td>0.486$^c$</td>
</tr>
<tr>
<td>Married</td>
<td>42 (87.5)</td>
<td>44 (93.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>6 (12.5)</td>
<td>3 (6.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Monthly income (RMB Yuan)</strong></td>
<td></td>
<td></td>
<td>9.000$^a$</td>
<td>0.061$^c$</td>
</tr>
<tr>
<td>&lt;1,000</td>
<td>3 (6.25)</td>
<td>2 (4.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,000 to 3,000</td>
<td>42 (87.5)</td>
<td>41 (87.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3,000</td>
<td>3 (6.3)</td>
<td>4 (8.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age (mean, SD) (years)</strong></td>
<td>66.63 (5.98)</td>
<td>67.1 (6.18)</td>
<td>0.916$^b$</td>
<td>0.362</td>
</tr>
</tbody>
</table>

$^a$ Chi-square test.

$^b$ t test.

$^c$ Fisher’s exact test.
trial group scores for the BBS and MFES were significantly higher than
the control group scores (Table 4).

**DISCUSSION**

With an increasingly growing aging society, falls in older adults have
turned into a major public health issue. It is documented that more than
one third of older adults fall at least once a year and more than half
of those falls lead to injury (Rose & Hernandez, 2010). Falls may lead to
serious injuries, such as fractures, brain damage, and even death, with
approximately 95% of hip fractures in older adults due to falls and more
than 20% of cases leading to death (Ioannidi et al., 2009; Wolinsky et
al., 2009). In the United States, falls are the leading cause of traumatic
brain injury in individuals older than 65 and are associated with the rise
of Medicare costs (Murphy, Baker, Leo-Summers, & Tinetti, 2014;
Thompson, McCormick, & Kagan, 2006). Exercise or physical therapy
is recommended by the U.S. Preventive Services Task Force to prevent
falls in community-dwelling adults 65 or older who are at increased risk
of falls (Croswell & Shin, 2012).

**TABLE 2**

<table>
<thead>
<tr>
<th>Test/Group</th>
<th>Baseline</th>
<th>Week 6</th>
<th>Week 12</th>
<th>Week 6 vs. Baseline (p Value)</th>
<th>Week 12 vs. Baseline (p Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUGT</td>
<td>Trial</td>
<td>9.15 (1.876)</td>
<td>7.91 (1.641)</td>
<td>7.127 (1.261)</td>
<td>0.561 (&lt;0.001*)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>9.48 (1.902)</td>
<td>8.92 (1.456)</td>
<td>8.625 (1.393)</td>
<td>0.830 (0.046*)</td>
</tr>
<tr>
<td></td>
<td>t test</td>
<td>0.852 (0.397)</td>
<td>3.015 (0.003*)</td>
<td>5.487 (&lt;0.001*)</td>
<td>3.015 (0.003*)</td>
</tr>
<tr>
<td>OLST</td>
<td>Trial</td>
<td>4 (2.313)</td>
<td>4.89 (2.672)</td>
<td>6.17 (2.995)</td>
<td>0.634 (&lt;0.001*)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>3.5 (1.786)</td>
<td>3.88 (1.77)</td>
<td>3.958 (1.867)</td>
<td>0.809 (0.085)</td>
</tr>
<tr>
<td></td>
<td>t test</td>
<td>–1.181 (0.241)</td>
<td>–2.195 (0.031*)</td>
<td>–4.329 (&lt;0.001*)</td>
<td>–2.195 (0.031*)</td>
</tr>
</tbody>
</table>

*p < 0.05.

**TABLE 3**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time Effects</th>
<th>Group Effects</th>
<th>Cross Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>TUGT</td>
<td>85.218</td>
<td>&lt;0.001*</td>
<td>9.355</td>
</tr>
<tr>
<td>OLST</td>
<td>43.432</td>
<td>&lt;0.001*</td>
<td>8.051</td>
</tr>
</tbody>
</table>

*p < 0.05.

Ba Duan Jin is a traditional Chinese exercise. It is a highly popular
practice, particularly in China, for health maintenance, healing, and
increasing vitality (Chen, 2007). Ba Duan Jin exercise is thought to
comprise a state that activates the natural self-regulation capacity and
stimulates the balanced release of endogenous neurohormones and
a wide array of natural health recovery mechanisms (Jahnke, Larkey,
Rogers, Etnier, & Lin, 2010). Several studies have shown that Ba
Duan Jin exercise can prevent bone loss and improve the quality of life
for middle-aged women (Chen, Yeh, & Lee, 2006; Hsu et al., 2008).
Ba Duan Jin has been shown to enhance sleep quality in older adults
(Chen, Liu, Huang, & Chiou, 2012), as well as alleviate symptoms of knee osteoarthritis (An et al., 2008). Systematic reviews have
shown Ba Duan Jin can decrease plasma total cholesterol, triglycerides, and low-density lipoprotein-C levels and increase plasma high-density lipoprotein-C levels (Mei et al., 2012). However, there is cur-
rently insufficient evidence to support Ba Duan Jin as an exercise to
improve the balance ability of older adults.
The current study findings show that after Ba Duan Jin intervention, dynamic balance (TUGT) and static balance (OLST) were improved at Weeks 6 and 12, indicating participants were experiencing continuously positive effects. BBS and MFES scores significantly increased after the 12-week intervention. BBS scores reflected the balance ability and its changes in older adults, whereas MFES scores involved confidence of maintaining balance in ADLs in older adults. The increases of BBS and MFES scores suggest that Ba Duan Jin exercise is better than walking in improving balance ability and self-efficacy of older adults.

LIMITATIONS
Some limitations should be acknowledged. Participants were mostly young-old adults (age 60 to 75 years), with mean ages of 67.1 (SD = 6.18) and 66.63 (SD = 5.98) in the trial and control groups, respectively; thus, results may be prejudiced by participants’ ages. The incidence of falls in the older-old population (age >75 years) is high, with studies reporting that the rate of falls and associated complications is more than 45% in these individuals (Rubenstein, 2006). Thus, falls prevention is a vital part of community care. To understand the effects of Ba Duan Jin on balance ability in older-old adults, a repeat study should be done in this population. In the future, to support the current study findings, the Ba Duan Jin technique merits longer-term studies with expanded sample sizes and increased balance function test tools in different communities and different population age groups (e.g., Western older adult populations).

CONCLUSION
Ba Duan Jin was associated with increased TUGT and OLST times at Week 6 with continuous increases through Week 12. Ba Duan Jin was also associated with improved BBS and MFES scores at Week 12. Results indicate that Ba Duan Jin, which may be a culturally preferable exercise for Chinese community-dwelling older adults, can be used to improve the balance ability of this population and consequently prevent falls and falls-induced injuries. Findings from the current study provide a basis for further development of community-based exercise programs for prevention of falls in older adults.

REFERENCES

<table>
<thead>
<tr>
<th>TABLE 4</th>
<th>COMPARISON OF THE BERG BALANCE SCALE (BBS) AND MODIFIED FALLS EFFICACY SCALE (MFES) SCORES BETWEEN GROUPS (N = 95)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Group</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>Baseline</td>
<td>Trial</td>
</tr>
<tr>
<td></td>
<td>Control</td>
</tr>
<tr>
<td>Week 12</td>
<td>Trial</td>
</tr>
<tr>
<td></td>
<td>Control</td>
</tr>
</tbody>
</table>

*p < 0.05.
Qigong Ba Duan Jin is an ancient Chinese health gymnastics technique that is simple and low in exercise intensity and has several proven health effects.

Ba Duan Jin was used in a sample of Chinese community-dwelling older adults to assess its efficacy in improving balance ability in this population.

Participants were divided into two groups, with the trial group performing Ba Duan Jin and the control group performing walking exercise for 12 weeks.

At Week 12, Ba Duan Jin was shown to be an effective means for improving balance ability in Chinese community-dwelling older adults, with increased times and scores in the Timed Up and Go Test, One Leg Standing Test, Berg Balance Scale, and Modified Falls Efficacy Scale.

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Keypoints

The Timed Up and Go test is a useful predictor of falls in community-dwelling older people. *Journal of the American Geriatrics Society, 46*, 928-930.


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