Pilot Study Comparing Physical and Psychological Responses in Medical Qigong and Walking

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Identifying alternative exercise modalities in an effort to stimulate and promote participation in physical activity, especially among older adults, is a critical health consideration. The purpose of this study was to compare physiological and psychological responses to medical qigong with self-paced brisk walking. Older women (55–79 years) performed 22 min of either qigong or walking on two separate days. During exercise performance, heart rate and ratings of perceived exertion were assessed. Psychological affect, blood pressure, and pulse rate were assessed before and after the exercise bouts. Heart-rate data indicated that both forms of exercise were at a moderate level of intensity. In addition, similar values were found for the physiological and psychological variables as a function of the two forms of exercise. Therefore, it was concluded that this form of medical qigong can be considered a moderate-intensity physical activity that should have both physiological and psychological benefits for older women.

Key Words: moderate exercise, positive and negative affect, rating of perceived exertion

A substantial body of research supports the idea that myriad health benefits derive from regular exercise participation (Blair et al., 1996; Phillips, Pruitt, & King, 1996). The concept that exercise is good for us has become widely accepted over the past few decades as increasingly more public information has been reported on the importance of exercise as a component of good health (Phillips et al.). Results from numerous large-scale epidemiological studies have shown improvements in physical and mental health, reductions in risk of certain diseases, and/or reduced mortality from certain diseases (King, Taylor, Haskell, & DeBusk, 1989; Morris, Clayton, Everitt, Semmence, & Burgess, 1990; Paffenbarger, Hyde, Wing, & Hsieh, 1986; Pate et al., 1995). Research also has shown that the introduction of exercise into the lives of otherwise sedentary individuals can have a positive impact on their health (Phillips et al.).

Based on these studies, recommendations to engage in exercise have been made by the U.S. Surgeon General (U.S. Department of Health and Human Services, 1996).
1996), the Centers for Disease Control and Prevention (CDC; Pate et al., 1995), and the American College of Sports Medicine (2000). These recommendations are based on the fact that substantial health benefits might accrue to otherwise sedentary individuals who engage in moderate-intensity physical activity for 30 min daily on most, preferably all, days of the week (American College of Sports Medicine; Pate et al.; U.S. Department of Health and Human Services).

In light of the health benefits of regular physical activity, one goal of the “Healthy People 2000” project was to have at least 30% of individuals age 6 years and older engaging in regular moderate physical exercise for at least 30 min daily (National Center for Health Statistics, 2001). Despite the research and a generally accepted perception of the benefits and importance of exercise, however, data indicate that fewer than 25% of U.S. adults currently engage in regular physical activity at a level that meets the moderate-intensity recommendation of the Surgeon General and the American College of Sports Medicine (U.S. Department of Health and Human Services, 1996). Furthermore, with increases in age, the percentage of sedentary adults tends to increase (U.S. Department of Health and Human Services). As a nation concerned with increasing physical activity levels, the development of methods to encourage adults to become and remain more active is of utmost importance. Thus, identifying alternative forms of physical activity that satisfy the definition of “moderate intensity” is a worthwhile endeavor.

Moderate-intensity physical activity is typically classified as activity performed at an intensity that generates 3–6 metabolic equivalents (METs; American College of Sports Medicine, 2000; Pate et al., 1995). Included in both the Surgeon General’s report and the recently updated Compendium of Physical Activities (Ainsworth et al., 2000) is a list of a variety of activities that represent a moderate level of intensity. Examples of physical activity typically considered to be of moderate intensity include mopping and vacuuming, raking the lawn, water aerobics and water calisthenics, and walking at a brisk pace of approximately 2.5–4 miles/hr (Ainsworth et al.; Pate et al.).

Participation in nontraditional exercises such as qigong, Tai Chi, and yoga has increased during the past 10–15 years (Corliss, 2001; Spencer, 2003). These forms of less strenuous exercise are particularly attractive for certain groups of individuals, including the elderly and those with health conditions or physical limitations (Chen, Snyder, & Krichbaum, 2001; Iwao, Kajiyama, Mori, & Oogaki, 1999; Luskin et al., 2000). Because of the low impact and slow movements of these activities, they are generally considered safe for most populations (Lan, Lai, & Chen, 2002; Luskin et al.). Because the elderly historically are the least active group of individuals (Balde, Figueras, Hawking, & Miller, 2003; Nied & Franklin, 2002; Rhodes et al., 1999; Stewart et al., 2001), finding alternative forms of moderate-intensity exercise for this population is an important consideration. Although many researchers have examined the physiological and psychological benefits of Tai Chi (for reviews see Verhagen, Immink, van der Meulen, & Biema-Zeinstra, 2004; Wang, Collet, & Lau, 2004; Wu, 2002), there are relatively few published studies that have examined these same variables relative to qigong. Qigong is not included in the Compendium of Physical Activities (Ainsworth et al., 2000), and its intensity level has not been tested empirically.

Qigong is a generic term that refers to methods that are used to promote and control qi (or chi) for many purposes including fostering health, for self-defense,
and for spiritual development (Jonas et al., 1999). Qi literally translates as vital energy, and gong translates as work. Both dynamic and meditative forms of qigong are designed to generate and preserve qi and to strengthen the body, mind, and spirit. Qigong exercises are not merely body movements; they also focus on the regulation of breathing and meditation designed to develop an altered state of consciousness.

Research has been conducted to determine the efficacy of qigong for various health problems and conditions and to judge its safety for certain populations (Gallagher, 2003; Kuang, Wang, Xu, & Qian, 1991). In addition, a recent study (Lan, Chou, Chen, Lai, & Wong, 2004) using only experienced older male participants indicated that during the performance of qigong, participants experienced an average heart rate of 54% of heart-rate peak. Finally, Luskin et al. (2000) have established that qigong is beneficial for reducing stress, enhancing relaxation, and improving respiratory function.

The purpose of this study was to compare qigong and self-paced walking in the interest of establishing qigong as a moderate-level exercise modality for older adults. A within-participants design was used to compare the physical and psychological responses of older women in a walking condition with those in a qigong condition. Walking was chosen as the exercise mode for comparison because it is the most common physical activity for older adults (Yusuf et al., 1996) and because it has established MET values.

**Materials and Methods**

**Participants**

Volunteers were recruited from existing qigong classes in Phoenix, AZ. Criteria for participation in the study were being female and age 55 years or older, having an indication of ability to participate in moderate-intensity level exercises by completion of the Physical Activity Readiness Questionnaire and a health-information questionnaire, and being familiar with the qigong exercises.

Nineteen participants initially volunteered for the study. Three could not be tested because of personal complications (i.e., recent surgery, scheduling difficulties). One additional participant was omitted from all analyses because she forgot to attend one of the testing sessions. Thus, 15 participants completed all testing sessions. One of these participants was excluded from heart- and pulse-rate analyses on the walking day because of equipment malfunction.

**Measures**

**Physical Activity for the Elderly Questionnaire.** The Physical Activity for the Elderly questionnaire provided data regarding physical activity levels of participants during leisure time and work-related activities over the prior 7 days. The survey was specifically developed to measure activity levels in older adults, and validity and test–retest reliability ($r = .75$) of the questionnaire have been established in older adults (Washburn, Smith, Jette, & Janney, 1993). This questionnaire was administered to provide descriptive information regarding the participants’ regular physical activity participation.
The Positive and Negative Affect Schedule. The Positive and Negative Affect Schedule (PANAS) is a 20-item self-report inventory used as a measure of affect. Two independent factors, positive affect (PA) and negative affect (NA), have been identified. Ten adjectives reflect PA, and 10 reflect NA. Test–retest reliabilities of the PANAS PA and NA subscales have been found to be .86 and .87, respectively, and the correlation between the scales was found to be –.09 (Watson, 1988).

Heart Rate. To assess heart rate (HR), participants wore Polar® Vantage XL heart-rate monitors. The monitors have been found to provide a valid measure of HR against electrocardiography during both laboratory (Goodie, Larkin, & Schauss, 2000) and field tests (Leger & Thivierge, 1988). Data were downloaded to Windows®-compatible Polar HR-analysis software, Version 4.10 (Polar Electro Oy, Finland). HR data were examined both as raw data (beats/min) and as percentage of age-predicted maximal HR (%HRmax). Age-predicted maximal HR was calculated as 220 – participant age. In an elderly population, the %HRmax approach has been demonstrated to correspond more closely with measured VO2 values than another frequently used method, known as the Karvonen or heart-rate-reserve (%HRR or HRR) method (Graves et al., 1992; Kohrt, Spina, Holloszy, & Ehsani, 1998; Panton et al., 1996), and %HRmax values could be easily compared with the exercise-intensity guidelines that have been provided.

Blood Pressure and Pulse Rate. Blood-pressure (BP) and pulse-rate (PR) measures were taken using the OMRON automatic digital blood-pressure and pulse monitor with IntelliSense (Model HEM-739AC).

Rating of Perceived Exertion. The Borg Rating of Perceived Exertion (RPE) scale (Borg, 1973) is an accepted self-report measurement of perceived exertion during exercise. Various scales and descriptive parameters have evolved since the original scale was developed; the scale used in this study ranged from 1 (very light) to 10 (maximum—can’t go on). RPE has been shown to be linearly related to HR during exercise (Dunbar et al., 1992).

Exercise Conditions

Qigong. Qigong originated in China, and many branches of it have developed over its 5,000-year history. The qigong exercises used in this program were compiled by qigong master Hong Liu and are a form of medical qigong (Yi Jia Gong), which is a form of qigong that was “specifically developed for the purpose of treatment and cure of disease” (Chen & Yeung, 2002, p. 532). This branch of qigong has been described in several publications (Cohen 1997; Jahnke, 2002; Yang, 1997) and consists of over 1,000 exercises developed with the purpose of opening each of the 12 major meridians recognized in traditional Chinese medicine as the energy channels through which qi flows throughout the body (Johnson, 2000). In this particular program, eight beginning exercises were taught to and performed by the participants while they were also taught to use conscious intention to move qi as a form of self-healing. These qigong exercises were all performed in a standing position with the feet in one of three positions: shoulder-width apart, together, or wider than shoulder-width apart. Movements were varied and involved deep squatting, lunging, forward bending, extending and raising the arms, rotating, and balancing.
on one leg. Each exercise was focused on two meridians and related organs in the body (e.g., the first exercise was focused on lungs and large intestine).

Because a single repetition of each of the exercises varies in length, each exercise was performed repeatedly for the same approximate prorata portion of the 22-min exercise segment. Participants were instructed to perform the exercises at their own comfortable self-selected pace and not to speak or interact with each other during exercise. A prerecorded video with an individual performing the exercises played during the session and was to be used as a reference for those who might need assistance with how to perform a specific exercise. Instructions on the video also directed participants when to move from the first exercise to the second exercise, to the third exercise, and so on throughout the series of eight exercises during the 22 min.

Walking. Walking was performed around the inside of a full-size gymnasium for a 22-min period. Participants were instructed to walk at a comfortable brisk self-selected pace and were asked not to interact or speak with one another.

Procedures
This study used a repeated-measures design with participants performing the walking session on one day and the qigong exercises on another day. Testing sessions took place at 8:00 a.m., in a full-size gymnasium in a community-college facility, and were held at least 3 days apart. Participants were randomly assigned to the order of testing.

Both the health-information questionnaire and the Physical Activity Readiness questionnaire were completed by participants either before or on the first day of testing, and these were reviewed for judgment of exclusion criteria. On both testing days, participants were rested (with 7 hr minimum sleep) and had refrained from smoking, taking caffeine, and exercising for 4 hr before testing.

On both testing days, the following procedures were followed (see Table 1 for timing of measurements). On participants’ arrival at the facility, the PANAS (preexercise) was completed. Participants then rested in a comfortable reclining or

Table 1  Timing of the Measurements Taken During Testing Sessions

<table>
<thead>
<tr>
<th></th>
<th>Heart rate</th>
<th>Blood pressure</th>
<th>Pulse rate</th>
<th>RPE</th>
<th>PANAS</th>
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<tbody>
<tr>
<td>Pretest</td>
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<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Post 10-min rest</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>7 min exercise</td>
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<td>X</td>
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<td>14 min exercise</td>
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<td>X</td>
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<tr>
<td>21 min exercise</td>
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<td>X</td>
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<tr>
<td>Immediately postexercise</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>15 min postexercise</td>
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<td>30 min postexercise</td>
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<td>45 min postexercise</td>
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</table>

Note. RPE = rating of perceived exertion; PANAS = Positive and Negative Affect Schedule.
semireclining position on the floor for 10 min with soft background music playing and blankets supporting them. After initial rest, HR monitors were placed on the participants. Resting measures of HR, BP, and PR were then taken.

Participants then performed the assigned 22-min exercise session in groups of 4–6 individuals. During exercise, HR and RPE were recorded at 7-min intervals. After exercise, participants remained in the testing area for an additional 45 min and were allowed to read or rest but were instructed not to talk to or interact with each other. During this 45-min period, the PANAS was completed at 15-min intervals. Immediately postexercise and at the end of the 45-min period, BP and PR were assessed. At the conclusion of the first day of testing, participants were asked to complete the Physical Activity for the Elderly questionnaire.

**Statistical Analyses**

Data were entered into the SPSS Version 12.0 for Windows software program. Repeated-measures analyses of variance (ANOVAs) were conducted with time and exercise condition as the independent variables. For all ANOVAs, the exercise condition had two levels: qigong and walking. The levels of the factor for time varied depending on the particular dependent variable. For all ANOVAs, significance was set at $\alpha < .05$. Descriptive statistics are expressed as $M \pm SE$. For all within-participants ANOVAs, sphericity was checked. For all effects, partial eta-squared ($\eta^2$) values are reported as an index of meaningfulness (small, partial $\eta^2 = .10$; moderate, partial $\eta^2 = .30$; large, partial $\eta^2 = .50$), and, given that this was a pilot study meant to guide future research, observed power (1-$\beta$) is also reported. If the data failed to meet the assumption of sphericity, the Huynh–Feldt epsilon adjustment was used to correct the degrees of freedom.

**Results**

Descriptive data for all the physiological variables and RPE can be found in Table 2, and, for the psychological variables, in Table 3.

**Participants.** Ages of participants ranged from 55 to 79 years (65.13 ± 1.82). The range of scores on the Physical Activity for the Elderly Questionnaire varied from 63 to 306 (146.87 ± 20.17).

**HR.** There was no significant difference in HR as a function of exercise condition, $F(1, 13) = 4.31, p = .06, \eta^2 = .25, 1-\beta = .49$. There was a significant main effect for HR as a function of time, $F(1.64, 21.32) = 69.71, p < .001, \eta^2 = .84, 1-\beta = 1.00$. This main effect was superseded by a significant interaction between exercise condition and time, $F(1.97, 25.59) = 6.40, p < .01, \eta^2 = .33, 1-\beta = .86$. HR values at preexercise were similar for qigong (75.73 ± 2.68) and walking (74.33 ± 3.27). After commencement of exercise, HR rose more quickly during walking (100.93 ± 3.84) than during qigong (91.07 ± 3.99) at the 7-min measurement and remained higher during walking (104.14 ± 4.01) than during qigong (97.13 ± 4.38) at 14 min. By 21 min, however, HR values were similar for both exercise conditions (walking, 105.57 ± 3.89; qigong, 102.00 ± 5.59).

When expressed as %HR$_{max}$, the main effect for exercise condition, $F(1, 13) = 4.25, p < .05, \eta^2 = .25, 1-\beta = .48$, and the main effect for time, $F(1.74, 22.56) = 67.87,$
Table 2  Means (SE) for the Physiological Variables and RPE at All Measurement Points Relative to the Two Exercise Conditions

<table>
<thead>
<tr>
<th></th>
<th>Postrest</th>
<th>7 min exercise</th>
<th>14 min exercise</th>
<th>21 min exercise</th>
<th>Immediately postexercise</th>
<th>45 min postexercise</th>
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<tbody>
<tr>
<td><strong>Heart rate</strong></td>
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</tr>
<tr>
<td>qigong</td>
<td>75.73 (2.68)</td>
<td>91.07 (3.99)</td>
<td>97.13 (4.38)</td>
<td>102.00 (5.59)</td>
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<tr>
<td>walking</td>
<td>74.33 (3.27)</td>
<td>100.93 (3.84)</td>
<td>104.14 (4.01)</td>
<td>105.57 (3.89)</td>
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<td><strong>% HR\textsubscript{max}</strong></td>
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<tr>
<td>qigong</td>
<td>49% (0.02)</td>
<td>59% (0.03)</td>
<td>63% (0.03)</td>
<td>66% (0.03)</td>
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<tr>
<td>walking</td>
<td>48% (0.02)</td>
<td>65% (0.03)</td>
<td>67% (0.03)</td>
<td>68% (0.02)</td>
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<tr>
<td><strong>Pulse rate</strong></td>
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<tr>
<td>qigong</td>
<td>71.87 (3.04)</td>
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<td></td>
<td></td>
<td>79.60 (3.88)</td>
<td>72.20 (3.72)</td>
</tr>
<tr>
<td>walking</td>
<td>71.80 (4.11)</td>
<td></td>
<td></td>
<td></td>
<td>82.40 (4.28)</td>
<td>72.93 (3.17)</td>
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<tr>
<td><strong>RPE</strong></td>
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<tr>
<td>qigong</td>
<td>3.17 (0.64)</td>
<td>3.80 (0.55)</td>
<td>4.33 (0.60)</td>
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<tr>
<td>walking</td>
<td>3.37 (0.40)</td>
<td>4.10 (0.50)</td>
<td>4.60 (0.51)</td>
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<tr>
<td><strong>Systolic blood pressure</strong></td>
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<tr>
<td>qigong</td>
<td>138.67 (6.89)</td>
<td></td>
<td></td>
<td>138.07 (7.12)</td>
<td>134.93 (4.70)</td>
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</tr>
<tr>
<td>walking</td>
<td>136.80 (6.63)</td>
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<td></td>
<td>138.13 (4.59)</td>
<td>130.53 (4.37)</td>
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<tr>
<td><strong>Diastolic blood pressure</strong></td>
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<tr>
<td>qigong</td>
<td>79.07 (3.02)</td>
<td></td>
<td></td>
<td>81.00 (3.28)</td>
<td>77.47 (2.77)</td>
<td></td>
</tr>
<tr>
<td>walking</td>
<td>75.07 (2.82)</td>
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<td></td>
<td>81.27 (2.59)</td>
<td>79.47 (2.76)</td>
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</tr>
</tbody>
</table>

*Note. %HR\textsubscript{max} = percentage of age-predicted maximal heart rate; RPE = rating of perceived exertion.*
<table>
<thead>
<tr>
<th></th>
<th>Preexercise</th>
<th>Immediately postexercise</th>
<th>15 min postexercise</th>
<th>30 min postexercise</th>
<th>45 min postexercise</th>
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<tbody>
<tr>
<td>Positive affect</td>
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<tr>
<td>qigong</td>
<td>34.07 (2.18)</td>
<td>35.93 (2.39)</td>
<td>31.67 (2.37)</td>
<td>29.93 (2.26)</td>
<td>28.73 (2.42)</td>
</tr>
<tr>
<td>walking</td>
<td>32.80 (2.16)</td>
<td>32.47 (1.54)</td>
<td>30.40 (2.10)</td>
<td>28.13 (2.22)</td>
<td>28.73 (2.39)</td>
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<tr>
<td>Negative affect</td>
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<tr>
<td>qigong</td>
<td>11.13 (0.52)</td>
<td>10.53 (0.32)</td>
<td>10.60 (0.32)</td>
<td>10.40 (0.27)</td>
<td>10.53 (0.47)</td>
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<tr>
<td>walking</td>
<td>10.60 (0.31)</td>
<td>10.93 (0.52)</td>
<td>10.80 (0.54)</td>
<td>10.53 (0.27)</td>
<td>10.60 (0.34)</td>
</tr>
</tbody>
</table>
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p < .001, \( \eta^2 = .84 \), 1-\( \beta = 1.00 \), were significant. These main effects were superseded by a significant interaction of exercise condition by time, \( F(2.01, 26.17) = 6.30, p < .01, \eta^2 = .33, 1-\( \beta = .86 \). Examination of the means indicated that the increase in %HR\text{max} from pretest to 7 min was larger for the walking group (pretest, 0.48 ± 0.02; 7 min, 0.65 ± 0.03) than for the qigong group (pretest, 0.49 ± 0.02; 7 min, 0.59 ± 0.03) but that %HR\text{max} was comparable for both groups by Minutes 14 (walking, 0.67 ± 0.03; qigong, 0.63 ± 0.03) and 21 (walking, 0.68 ± 0.02; qigong, 0.66 ± 0.04). It is important that the mean %HR\text{max} values for both qigong and walking were within the range of 59–68% at all time points during the exercise activity.

BP. No significant differences were found for systolic BP as a function of exercise condition, \( F(1, 14) = 0.38, p = .55, \eta^2 = .03, 1-\( \beta = .09 \); time, \( F(2, 13) = 2.37, p = .13, \eta^2 = .27, 1-\( \beta = .39 \); or as a function of the interaction of exercise condition by time, \( F(2, 13) = 0.49, p = .62, \eta^2 = .07, 1-\( \beta = .11 \).

For diastolic BP, there were no significant differences found as a function of exercise condition, \( F(1, 14) = 0.22, p = .65, \eta^2 = .02, 1-\( \beta = .07 \); or as a function of the interaction of exercise condition by time, \( F(1.52, 21.22) = 2.26, p = .14, \eta^2 = .14, 1-\( \beta = .36 \). There was a significant main effect for time, \( F(2, 13) = 4.22, p < .05, \eta^2 = .39, 1-\( \beta = .63 \), such that diastolic BP values increased from preexercise (77.07 ± 2.83) to postexercise (81.13 ± 2.79) and then decreased at 45 min postexercise (78.47 ± 2.43).

PR. No significant difference was found as a function of exercise condition, \( F(1, 14) = 0.51, p = .49, \eta^2 = .04, 1-\( \beta = .10 \). A significant main effect for time was found, \( F(2, 13) = 14.09, p < .001, \eta^2 = .68, 1-\( \beta = .99 \), such that PR increased from preexercise (71.83 ± 3.04) to postexercise (81.00 ± 3.90) and then returned to near baseline levels by 45 min postexercise (72.57 ± 3.38). No significant interaction was found for PR as a function of exercise condition by time, \( F(2, 13) = 0.62, p = .55, \eta^2 = .09, 1-\( \beta = .13 \).

RPE. There was no significant difference in RPE as a function of exercise condition, \( F(1, 14) = 0.73, p = .49, \eta^2 = .05, 1-\( \beta = .13 \). There was, however, a significant difference in self-reported RPE values as a function of time, \( F(1.37, 19.16) = 18.53, p < .001, \eta^2 = .57, 1-\( \beta = 1.00 \), with RPE values increasing from 7 min (3.27 ± 0.49) to 14 min (3.95 ± 0.50) to 21 min (4.47 ± 0.53). There was no significant interaction between exercise condition and time, \( F(1.50, 21.02) = 0.03, p = .93, \eta^2 = .00, 1-\( \beta = .05 \).

Affect. With respect to PA, no significant differences were found as a function of exercise condition, \( F(1, 14) = 0.93, p = .35, \eta^2 = .06, 1-\( \beta = .15 \), or of the interaction of exercise condition by time, \( F(4, 11) = 1.47, p = .28, \eta^2 = .35, 1-\( \beta = .32 \). A significant main effect was found for time, \( F(2.14, 30.00) = 8.68, p < .001, \eta^2 = .38, 1-\( \beta = .96 \), such that PA increased from preexercise (33.43 ± 2.04) to immediately postexercise (34.20 ± 1.71) and then gradually decreased during the recovery period (15 min post, 31.03 ± 1.98; 30 min post, 29.03 ± 2.03; 45 min post, 28.73 ± 2.29).

For NA, no significant difference was found for exercise condition, \( F(1, 14) = 0.13, p = .72, \eta^2 = .01, 1-\( \beta = .96 \); time, \( F(1.41, 19.73) = 0.39, p = .61, \eta^2 = .03, 1-\( \beta = .10 \); or the interaction of exercise condition by time, \( F(1.79, 25.04) = 1.16, p = .33, \eta^2 = .08, 1-\( \beta = .22 \).
Discussion

Having a broader complement of exercise options available is an important consideration given the unequivocal research supporting lowered risk of certain diseases and reduced mortality levels for individuals who participate in regular moderate-intensity exercise (Paffenbarger et al., 1986; Pate et al., 1995). This is especially valuable for seniors, who are the least physically active population group (Nied & Franklin, 2002; Rhodes et al., 1999) and have the highest incidence of illness and health problems (Dychtwald, 1999; Lesnoff-Caravaglia, 2000). Therefore, the purpose of this study was to compare the two exercise conditions of qigong and walking to ascertain whether or not this form of medical qigong might serve as an alternative form of moderate-intensity exercise for older women.

For all physiological variables (with the exception of SBP), the main effect for time was significant. As anticipated, and not surprisingly, these variables demonstrated moderate to large effects (partial $\eta^2 = .38–.84$) in response to the performance of exercise, and physiological arousal increased as a result of participation in either mode of exercise. There were significant interaction effects (partial $\eta^2 = .33$) for exercise condition by time for HR and %HR$_{max}$. The nature of these interactions was such that HR increased most quickly during the walking condition but was essentially equivalent between the two conditions by the 14-min and 21-min time points. Furthermore, the data indicated that, for this group of 55- to 79-year-old women, both qigong and walking exercise provided moderate-intensity-level ranges within ACSM guidelines (American College of Sports Medicine, 2000). This finding is consistent with the findings of Lan et al. (2004), who tested older men and reported that the intensity of qigong was at 54% of HR peak. Furthermore, it has been previously established that walking falls within the moderate-intensity range of activity, generating between 3 and 6 METs, if performed at a 2.5- to 4-mile/hr pace (Ainsworth et al., 2000). In this study, participants were instructed to walk at a brisk pace. Hence, comparatively, the findings of this study suggest that qigong is a moderate-intensity form of exercise with MET values comparable to those achieved during brisk walking (3–6 METs). Future research is needed to confirm the specific MET values of qigong exercise.

Psychological responses to these two forms of exercise were also examined. Results showed no significant differences between the two conditions for RPE or for either NA or PA (partial $\eta^2 = .01–.06$). There was, however, a significant main effect for time for RPE (partial $\eta^2 = .57$). Typically, RPE values have correlated with actual exertion as measured by HR or %VO$_2$ (Dunbar et al., 1992) and have been used as an adjunct method for measuring exercise intensity. Results of this study showed that participants reported an increase in RPE with exercise participation and that the increase in RPE did not differ as a function of the exercise condition. A significant main effect for time for PA was also found. The strength of this association was moderate (partial $\eta^2 = .38$) and indicated that PA values were affected in a favorable direction for a short period of time. The improvement was not long lasting, however, with the value increasing postexercise but dropping after 45 min postexercise to slightly below the preexercise level. The two forms of exercise did, however, show comparable effects on the psychological affect of participants.

A limitation of this study is that a relatively small sample size was used. Thus, the failure to demonstrate significant main effects for exercise condition (when not
superseded by a significant interaction effect) and the failure to observe significant interaction effects for exercise condition by time could be a result of low statistical power. Conventionally, the desired level of statistical power is set at $1-\beta = .80$. The statistical power for the nonsignificant effects of interest in this pilot study was extremely low ($1-\beta = .05–.36$). For most of the dependent variables (diastolic BP, systolic BP, PR, RPE, NA), however, the strength of the associations was also small (partial $\eta^2 = .00–.09$), indicating that, in this sample, these effects were not meaningful. Although the use of a larger sample in subsequent research would increase statistical power and might result in these effects reaching statistical significance, if the strength of association remained as small as was found in this pilot study, the effects would be interpreted as being not meaningful. Thus, it is our conclusion that the nonsignificant effects are indicative of these variables being affected similarly by walking and qigong. In contrast, the strength of association for the interaction effect for PA (partial $\eta^2 = .35$) was moderate, and, thus, it is our conclusion that the failure for this interaction effect to reach statistical significance was largely a result of the small sample size and the resultant low statistical power ($1-\beta = .32$). A replication of this study with a larger sample would be likely to demonstrate statistically significant differences in the PA responses to these two types of exercise over time, and future study should examine this possibility. Overall, however, given that the partial $\eta^2$ values were extremely small for most of the nonsignificant effects, these data support our conclusion that the two exercise modes are of similar intensity and provide comparable psychological benefits.

Although qigong remains relatively unfamiliar in the West as a form of exercise or as a medical modality, its popularity is increasing (Spencer, 2003). The results of this study indicate that this form of medical qigong meets the definition of a moderate-intensity exercise because the $\%HR_{max}$ values were within the American College of Sports Medicine’s recommended range of 55–69%. Furthermore, the results from the PANAS indicate that this form of qigong results in affective effects similar to those of brisk walking. Given that qigong has been shown to be safe for older adults (Luskin et al., 2000) and that the results of this study indicate that it satisfies the criterion for moderate-level physical activity, qigong should be considered a viable and beneficial moderate-intensity modality of exercise for older women. In addition, it is important to point out that proponents of qigong suggest that it might have unique benefits that result from the generation and preservation of qi, and, thus, participation in qigong might result in positive effects that cannot be obtained with simple walking.

References


