RETRACTED
between civilians and public officials. Organization development functions to strengthen the community through existing programs. Community organization is the process by which people work together to solve problems and achieve common goals. These strategies of community capacity may lead to positive behavioral changes to maintain community health [8]. Zgibor et al [9] reported that a community health promotion project for garlic farmers was effective for leadership development and partnership formation strategies. Stolee et al [10] showed that elderly who were home-bound maintained exercise regimen after following the instructions of volunteer-led health leaders. Draper et al [11] stated that the health-related quality of life for seniors in home care improved after exercise with the assistance of a self-help group. Prior studies have confirmed the effectiveness of exercise interventions that used a single strategy for community capacity. However, few studies have demonstrated the effectiveness of an integrated community capacity-based exercise maintenance intervention for the frail elderly.

These days, case management project for frail elderly people is being carried out at all public health centers nationwide based on the national health plan 2020 policy in South Korea [12]. Physical activity out of case management project contributes to physical fitness improvement, but there is no sustained exercise in the community [13]. Therefore, there is a need for a new strategy to induce the frail elderly to practice exercise regularly in daily life in the community.

Based on the weaknesses in several observation studies, the present study was developed to maintain exercise, including strategies such as using a health leader, organizational committee, rhythmic exercise, and a self-help group. Therefore, the Community Capacity Building Exercise Maintenance Program (CCBEMP) was developed to maintain exercise among frail elderly women in the community. Exercise of frail elderly improves physical fitness and changes body composition, such as increased muscle mass and decreased body fat [3]. Bandura [14] emphasized self-efficacy as a predictor of the duration of exercise. In previous studies [1,10], health-related quality of life increased when the frail elderly continued to exercise. Therefore, evaluation parameters included physical fitness, body composition, self-efficacy, and health-related quality of life to assess the effect of intervention.

### Purpose

The purpose of this study was to examine the effects of CCBEMP in comparison with health physical exercise program in frail elderly women. Significant differences in physical fitness, physical function, self-efficacy, and health-related quality of life were hypothesized between the experimental and control groups. We hypothesized that, in the experimental group with CCBEMP, physical fitness (muscular strength, flexibility, static balance, and muscular endurance), physical function, self-efficacy, and health-related quality of life would show greater increase than in the control group over time.

### Methods

#### Study design

The framework was designed using intervention strategies based on the CCB model [6] (Figure 1). Regarding the community capacity resources, the intervention was constructed to include the following elements: leadership development of a health leader, partnership formation to organize committee activities, organization development of rhythmic exercise, and community systematization based self-help group. This study was a single-blinded and a nonequivalent control group pretest-posttest design (Table 1). The experimental group performed CCBEMP for 50 minutes twice a week for 8 weeks. The control group performed the health physical exercise routinely provided in the public health center, for 50 minutes twice a week for 8 weeks. The study variables were measured in both groups three times: before the intervention (pretest 1), immediately after the intervention (post test 1), and 8 weeks after the intervention (post test 2).

#### Participant sampling

Participants were recruited through direct recruitment in six different public health centers located in D city, South Korea. The participants at the public health centers where they volunteered to participate in the study were randomly assigned to the

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*Figure 1. Study framework.*
experimental and control groups (1:1 ratio) by drawing lots. Those who chose an odd number were assigned to the experimental group, and those who chose an even number were assigned to the control group.

The criteria for the participant selection were as follows: elderly women who (a) were over 70 years of age, who have been registered in the frail group of a home-visiting healthcare service; (b) had no impairment of cognitive ability; (c) had no medical history of cardiovascular disease (angina pectoris, heart failure, arrhythmia, etc.), except hypertension (this was based on the rationale for Rikli and Jones’ safe elderly exercise [15]); and (d) agreed not to receive other exercise-interventions during the experimental period.

$G^*\text{power 3.1}$ statistical analysis was used to determine the sample size for the repeated measure analysis with a significance level of .05, power of 0.8 and effect size of .35. The effect size of .35 was calculated based on estimation from the previous study, which evaluated the effectiveness of a dance movement program among community-living elderly women [5]. Although the number of participants needed per group was 23 for effectively assessing differences in averages, the researcher obtained 54 participants with 27 in each group in anticipation of dropout.

Nine participants dropped out (reasons for withdrawal are shown in Figure 2) and the dropout rate was 16.7%. Thus, the total number of the participants was 45: 22 in the experimental group and 23 in the control group.

### Measurements

#### Physical fitness

Physical fitness was measured with muscular strength, flexibility, static balance, and muscular endurance. The measurement method of physical fitness was performed according to the senior fitness test manual [15].

Muscular strength was measured by the “chair stand” test. Participants placed their hands on the respective opposite shoulder crossed at the wrists and kept their feet flat on the floor while seated in a 15-inch chair. The number of times they came to a full standing position and down again in 30 seconds was counted twice. Higher scores indicated greater muscular strength.

Flexibility was measured by the “sit-and-reach” test using a chair. The participants sat on the edge of a chair while one foot remained flat on the floor. The other leg was extended forward with the knee straight, the heel on the floor, and the ankle bent at a 90° angle. Participants stretched their arms out and placed one hand on top of the other. The tips of their middle fingers were instructed to be uniform. They were then instructed to bend forward and reach toward their toes if the fingers did touch the toes, the distance between the tip of the finger and the toes was measured as a positive score. If the fingers did not touch the toes, the distance between was measured as a negative score. These measurements were taken twice in centimeters, and a higher score indicated greater flexibility.
Static balance was assessed using a test called the “one-leg standing with open eyes test.” Performed with eyes open, the participants stood unassisted on one leg. They were timed in seconds from the moment their foot rose off the floor to the moment it touched the ground or the other standing leg. Participants chose which leg they preferred to stand on to ensure their best results. Termination or a failed test was recorded if (a) the foot touched the support leg, (b) hopping occurred, (c) the foot touched the floor, or (d) the arms touched something for support. The length of time that the participant could maintain this position was recorded within 0.1 seconds. Higher scores indicated greater balance.

Muscular endurance was measured using a 2-minute “step in place test”. Participants stood with their backs to the wall. Tape was placed in front of the participant midway between the patella (knee cap) and iliac crest (top of the hip bone). Participants then marched in place for 2 minutes, lifting their knees to the height of the tape. The number of times the right knee contacted the tape within 2 minutes was recorded. Higher scores indicated greater muscular endurance.

Body composition

Body composition was measured with body fat measuring device (GAIA 350 plus by Jawon Medical Co, Seoul, South Korea). The accuracy of the device is 98.0% and the sensitivity is 97.0% (Jawon Medical Co., Ltd., Seoul, South Korea). This device is known to be highly valid in South Korea. The measured values of muscle mass and body fat were kilogram (kg) and percentage (%), respectively, shown on the display board of the machine.

Self-efficacy for exercise

The self-efficacy for exercise was measured using the self-efficacy scale developed by Bandura [14], Kang and Kim [16] evaluated the validity and reliability of it for the Korean elderly. The self-efficacy for exercise assessed expectations related to the ability to continue exercising in the face of environmental barriers. The self-efficacy scale consisted of 16 questions. Each item was rated on a 5-point Likert scale ranging from 1 (not at all confident) to 5 (highly confident). The score range of self-efficacy was 16 to 80 and higher scores indicate more positive confidence in the exercise. The Cronbach’s α for the original scale was .95 [14], and .95 in this study.

Health-related quality of life

The health-related quality of life was measured using the EuroQol EQ-5D Scale developed by the EuroQol Group [17]. The EQ-5D descriptive system comprises five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension assessed the function through three levels: 1 (no problems), 2 (some problems), and 3 (severe problems). Scores for the five dimensions were combined to fully assess the respondent’s state of health. In this study, the calculated the EQ-5D index by applying the weighing model from Nam et al [18]. As such, EQ-5D index was calculated as follows: 1 − (0.050 × Mobility 1 + 0.096 × Mobility 2 + 0.135 × Self-Care 2 + 0.135 × Self-Care 3 + 0.069 × Usual Activities 1 + 0.028 × Usual Activities 3 + 0.037 × Pain/discomfort 1 + 0.151 × Pain or Discomfort 2 + 0.043 × Anxiety or Depression 3 + 0.158 × Anxiety or Depression 2 + 0.050 × N3 is subtracted if some dimension reaches 3).

The score range of EQ-5D was from 1 to −1. The closer to 1 the indicator value is, the more complete the health status and the higher the quality of life. The Cronbach’s α of the research from Nam et al [18] was .78 and .85 in this study.

CCBEMP intervention

The CCREMP intervention utilized the capacity of a rhythmic exercise, an organizational committee activity, a health leader, and a self-help group. The CCBEMP intervention conducted experimental research on participants from three public health centers during 16 sessions, twice a week for the 8 weeks. The intervention was carried out together with 7 participants from A public health center, 8 participants from B public health center, and 7 participants from C public health center.

The rhythmic exercise which lasted for 50 minutes each session included three steps: a 10-minute warm-up, a 30-minute target exercise, and a 10-minute warm-down. The warm-up and the warm-down exercise began by targeting body areas away from the heart, then closer to the heart to relax the muscles and joints. During the target exercise, the muscle strengthening movements included firmly pushing the hands and legs and the aerobic exercise was based on rhythmic movements. The difficulty of the rhythmic exercise gradually increased in sequence. The intensity of movement was adjusted to maintain 40.0% of low heart rate reserve. The rhythmic exercise song used rhythmic movements to improve stepping, joint mobility, muscle strengthening, and cardiovascular endurance. Children’s songs, folk songs, and popular songs were chosen based on the preferences of fragile elderly women. The movement followed exercise safety guidelines for the elderly.

The rhythmic exercise in intervention groups was preceded by health leaders. They demonstrated it to the frail elderly to help them follow the process through repetition. One health leader was selected for each intervention group. Before intervention, three completed the educational course on rhythmic exercise, provided by exercise instructors from an association in South Korea.

The organizational committee was organized for performing the exercise activity level in public health centers and building partnerships with the staff of public health centers. It consisted of one chief, three practitioners of the public health center, and three community leaders from intervention participants. Through cooperative relationship between participants and public staff, participants were encouraged to take responsibility for their health with mutual ownership.

In the intervention participants, a self-help group was organized from each public health center. It was formed to provide social support, encourage self-esteem, promote healthy lifestyle adjustments, and provide a spiritual community. It was led by the committee member during the 30 minutes before rhythmic exercise and its members shared their thoughts and feelings about the performance of their exercise regimen.

Data collection

The data were collected from October 2015 to February 2016. The six research assistants measured the study variables three times for both groups: before the intervention (pretest), immediately after the intervention (post test 1), and 8 weeks after the intervention (post test 2) The methods of physical measurement, usage of measuring instruments, and surveys before the study were provided to train the research assistants by the researcher. To reduce error, each measurement was completed at a time with the assistant’s help. After data collection was complete, participants in the control group were provided with materials, the same as the experimental group’s, and invited to participate in the intervention.

Ethical consideration

To protect the rights of the participants, this study was reviewed and approved by the Kyungpook National University Institutional Review Board (Approval no. IRB-2015-0030). All participants provided informed consent prior to data collection. Information relevant to informed consent included: the purpose of the study,
voluntary nature of participation, right to refuse to participate in the study and to withdraw consent at any time without reprisal, anticipated benefits and potential risks of the study, and confidentiality of responses.

After the study, the researcher told participants in the control group that they could be provided with the same intervention, CCBEMP like the experimental group, if they wanted. The participants provided written consent to participate in the study.

Statistical analysis

The data were analyzed using SPSS 21.0 for Windows (IBM Corp., Armonk, NY, USA). Participant samples confirmed the normal population through normality test using Kolmogorov-Smirnov test. The researcher performed descriptive statistical analysis on demographic data. Homogeneity was verified using independent t tests, Chi-square test, and Fisher’s exact test. To test the effectiveness of the intervention, repeated measures analysis of variance was used to determine the change in physical fitness, body composition, self-efficacy, and health-related quality of life between the groups over time.

Results

Participant characteristics

Table 2 shows the homogeneity test of general characteristics; 45 elderly women participated in this study. There were 22 participants in the experimental group and 23 participants in the control group. Of the 45 participants, the age range was above 70 years, with the largest group aged 70 to 74 years (37.8%), followed by those aged 75 to 79 years (33.3%). Most participants reported that they had graduated elementary school (97.8%). Results showed that the majority lived alone (51.1%), were of moderate economic level (62.2%), felt that their subjective health status was poor (71.1%), and were Buddhist (51.1%). There were no significant differences in general characteristics between the two groups.

Comparison of study variables between groups at baseline

Table 3 shows the scores of physical fitness, body composition, self-efficacy, and health-related quality of life. These variables were compared between groups before the intervention began. Between the two groups, no significant difference was found in scores for physical fitness, body composition, self-efficacy, and health-related quality of life.

Effects of intervention

According to Table 4, a repeated measures analysis of variance revealed significant differences in study variables between groups. There were statistically significant differences between groups in static balance (F = 35.12, p < .001), muscular endurance (F = 43.47, p < .001), static balance (F = 29.02, p < .001), muscle mass (F = 14.67, p < .001), self-efficacy

Note. CG = control group; EG = experimental group; a Fisher’s exact test.

Table 2 Homogeneity Test of General Characteristics (N = 45).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Categories</th>
<th>EG (n = 22)</th>
<th>CG (n = 23)</th>
<th>Total (N = 45)</th>
<th>( \chi^2 )</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>70–74</td>
<td>11 (36.3)</td>
<td>9 (39.0)</td>
<td>17 (37.8)</td>
<td>1.95</td>
<td>.625</td>
</tr>
<tr>
<td></td>
<td>75–79</td>
<td>6 (23.8)</td>
<td>7 (30.3)</td>
<td>13 (28.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 80</td>
<td>5 (23.8)</td>
<td>7 (30.3)</td>
<td>12 (25.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>≤ Elementary</td>
<td>22 (95.6)</td>
<td>22 (95.7)</td>
<td>44 (97.8)</td>
<td>0.98</td>
<td>.391</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>0 (0.0)</td>
<td>1 (4.3)</td>
<td>1 (2.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living arrangement</td>
<td>With spouse</td>
<td>8 (36.4)</td>
<td>7 (30.3)</td>
<td>15 (33.3)</td>
<td>2.44</td>
<td>.186</td>
</tr>
<tr>
<td></td>
<td>Alone</td>
<td>6 (27.3)</td>
<td>7 (30.3)</td>
<td>13 (28.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>With family member</td>
<td>4 (18.2)</td>
<td>4 (17.4)</td>
<td>8 (17.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic level</td>
<td>Good</td>
<td>3 (13.6)</td>
<td>2 (8.7)</td>
<td>5 (11.1)</td>
<td>0.77</td>
<td>.685</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>13 (59.1)</td>
<td>15 (65.2)</td>
<td>28 (62.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>6 (27.3)</td>
<td>6 (26.0)</td>
<td>12 (26.0)</td>
<td>1.66</td>
<td>.200</td>
</tr>
<tr>
<td>Subjective health state</td>
<td>Good</td>
<td>2 (9.1)</td>
<td>2 (8.7)</td>
<td>4 (8.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>5 (22.7)</td>
<td>4 (17.4)</td>
<td>9 (20.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>15 (68.2)</td>
<td>17 (73.9)</td>
<td>32 (71.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td>Buddhism</td>
<td>11 (50.0)</td>
<td>12 (52.2)</td>
<td>23 (51.1)</td>
<td>0.02</td>
<td>.952</td>
</tr>
<tr>
<td></td>
<td>Christian</td>
<td>4 (18.2)</td>
<td>4 (17.4)</td>
<td>8 (17.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>7 (31.8)</td>
<td>7 (30.4)</td>
<td>14 (31.1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. CG = control group; EG = experimental group; a Fisher’s exact test.

Table 3 Comparison of Study Variables Between Groups at Baseline (N = 45).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Categories</th>
<th>EG (n = 22)</th>
<th>CG (n = 23)</th>
<th>t</th>
<th>p</th>
<th>Possible score range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical fitness</td>
<td>Strength (freq)</td>
<td>9.77 ± 2.75</td>
<td>10.13 ± 4.06</td>
<td>-0.34</td>
<td>.732</td>
<td>8.21, 17.28</td>
</tr>
<tr>
<td></td>
<td>Flexibility (cm)</td>
<td>-3.61 ± 8.85</td>
<td>-3.17 ± 11.32</td>
<td>-0.04</td>
<td>.965</td>
<td>-2.52, 8.31</td>
</tr>
<tr>
<td></td>
<td>Static balance (sec)</td>
<td>4.01 ± 4.96</td>
<td>3.04 ± 2.92</td>
<td>1.08</td>
<td>.284</td>
<td>2.90, 11.39</td>
</tr>
<tr>
<td></td>
<td>Muscular endurance (freq)</td>
<td>21.36 ± 22.56</td>
<td>21.48 ± 21.47</td>
<td>-.01</td>
<td>.986</td>
<td>20.12, 53.81</td>
</tr>
<tr>
<td>Body composition</td>
<td>Body fat (%)</td>
<td>34.15 ± 3.65</td>
<td>34.63 ± 2.88</td>
<td>-.49</td>
<td>.623</td>
<td>30.23, 36.81</td>
</tr>
<tr>
<td></td>
<td>Muscle mass (kg)</td>
<td>31.30 ± 3.74</td>
<td>32.15 ± 3.39</td>
<td>-.36</td>
<td>.720</td>
<td>29.92, 35.88</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td></td>
<td>37.60 ± 10.35</td>
<td>37.72 ± 12.26</td>
<td>-.03</td>
<td>.974</td>
<td>36.34, 65.42</td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td>0.83 ± 0.11</td>
<td>0.84 ± 0.10</td>
<td>-.03</td>
<td>.974</td>
<td>0.78, 0.92</td>
</tr>
</tbody>
</table>

Note. CG = control group; EG = experimental group; freq = frequency; M = mean; SD = standard deviation.
Effect of CCBEMP.

**Variables** | **Pretest** | **Post test 1** | **Post test 2** | **Group** | **Time** | **Group × time**
--- | --- | --- | --- | --- | --- | ---
Strength (freq) | 9.77 ± 2.73 | 14.05 ± 2.68 | 16.05 ± 3.03 | 2.38 (.130) | 53.10 (<.001) | 6.76 (.002)
EG | 10.13 ± 4.06 | 12.78 ± 3.66 | 13.00 ± 3.72 |
Flexibility (cm) | | | | |
EG | −3.61 ± 8.83 | 5.90 ± 6.41 | 7.36 ± 6.07 | 0.68 (.414) | 60.33 (.001) | 4.53 (.220)
CG | −3.47 ± 11.32 | 3.76 ± 6.70 | 4.30 ± 5.62 |
Static balance (sec) | 4.01 ± 4.96 | 9.09 ± 7.78 | 10.44 ± 7.45 | 5.42 (.025) | 29.02 (<.001) | 4.60 (.013)
EG | 3.04 ± 2.92 | 5.34 ± 4.41 | 5.42 ± 3.54 |
Muscular endurance (freq) | 21.36 ± 22.56 | 47.68 ± 23.50 | 50.45 ± 23.19 | 3.35 (.074) | 9.12 (<.001) | 6.20 (.003)
EG | 21.48 ± 21.47 | 33.83 ± 21.08 | 32.33 ± 20.81 |
CG | 21.18 ± 22.66 | 47.68 ± 23.50 | 50.45 ± 23.19 |
Body fat percentage (%) | 34.15 ± 3.65 | 33.45 ± 3.33 | 32.94 ± 3.16 | 3.61 (.06) | 3.85 (.026) | 5.59 (.005)
EG | 34.63 ± 2.88 | 35.37 ± 2.86 | 35.21 ± 2.88 |
Muscle mass (kg) | 31.30 ± 3.74 | 32.38 ± 3.52 | 34.26 ± 3.61 | 19 (.658) | 10 (.007) | 0.42 (.658)
EG | 32.15 ± 3.39 | 32.28 ± 3.41 | 34.60 ± 2.72 |
Self-efficacy | 37.60 ± 10.35 | 57.59 ± 10.74 | 59.50 ± 11.12 | 8.79 (.05) | 92.99 (<.001) | 34.14 (<.001)
EG | 37.72 ± 12.26 | 43.73 ± 14.83 | 42.30 ± 14.31 |
CG | 37.72 ± 12.26 | 43.73 ± 14.83 | 42.30 ± 14.31 |
Quality of life | 0.83 ± 0.11 | 0.87 ± 0.08 | 0.90 ± 0.07 | 0.89 (.57) | 7.03 (.001) | 3.63 (.030)
EG | 0.84 ± 0.10 | 0.84 ± 0.10 | 0.84 ± 0.10 |
CG | 0.84 ± 0.10 | 0.84 ± 0.10 | 0.84 ± 0.10 |

Note. CCBEMP = Community Capacity Building Exercise Maintenance Program; CG = control group; EG = experimental group; freq = frequency; SD = standard deviation.

(F = 82.41, p < .001), and health-related quality of life (F = 75.33, p = .001). There were significant interactions between group and time in muscular strength (F = 4.76, p = .002), static balance (F = 4.60, p = .013), muscular endurance (F = 6.20, p = .003), body fat (F = 5.59, p = .005), self-efficacy (F = 34.14, p < .001), and health-related quality of life (F = 3.63, p = .030).

Discussion

This study demonstrated the effects of CCBEMP on physical fitness, body composition, self-efficacy, and health-related quality of life in frail elderly women.

This study showed that physical fitness except flexibility steadily increased in the experimental group, which regularly exercised over time. However, there was no increase in physical fitness of the control group, who participated in a health physical exercise. The results of this study were consistent with those of studies by Ozcan [19], Song et al [20] and Song et al [21], in which physical function in the elderly increased after maintaining regular exercise. The results were also consistent with those of a study by Grim et al [22], in which the physical strength of the elderly older than 75 years of age significantly improved after doing suitable exercises regularly. Compared to the previous studies, this study showed that physical fitness improved directly through the exercise maintenance program. Furthermore, the effect of improvement was proportional to the period of exercise maintenance. However, flexibility was not significantly increased through this intervention. We considered that the rhythmic exercise of CCBEMP was weakly structured, which might limit the flexibility of the elderly. It is essential that physical fitness can prevent falls and be strengthened if steadily personalized [23].

Participation of motion and extension range of joint exercise should be reinforced and integrated into the development of a long-term exercise maintenance program to increase physical fitness. In the experimental group, physical fitness improved steadily over time, while the control group showed no improvement in physical fitness after termination of the experiment. During the experimental intervention, physical fitness also increased in the control group. However, they could not continue exercise without any strengthened community capacity after the end of the intervention and eventually decreased physical fitness because of aging. This indicates that the frail elderly women may improve physical fitness for a short time but if they do not exercise regularly, their physical fitness could decrease again due to aging.

Body fat percentage was effectively reduced through the significant interaction effect of group and time of measurement. This was consistent with results of the study by Bergamin et al [24], in which the body composition significantly changed using aquatic exercise to mobilize community resources in the elderly. The gradual increase in muscle mass was shown between the experimental and control groups, but there was no significant interaction effect of the group and time period. The intensity of the rhythmic exercise was low; therefore, it was hard to demonstrate a change in muscle mass.

The findings of this study showed significant improvement in self-efficacy for exercise after the CCBEMP, compared to the control group over time. This was consistent with results from the previous study showing the self-efficacy change after an intensive therapeutic exercise in a self-help group for the frail elderly [25]. Similarly, van het Reve et al [26] reported that the self-efficacy on exercise of the elderly who lived alone correlated with the duration of exercise. Sherrington et al [27] suggested that an exercise to prevent falls should be continued with elderly who had positive beliefs on the effects of the community-based exercise program. With these results, the self-efficacy on exercise can be a theoretical basis for the motivation to continue an exercise regimen. Self-efficacy on exercise was shown to be the main variable that strongly influenced exercise behaviors. These allow the elderly to acquire the responsibility and willpower to manage their health problems through self-help groups. Their activity was used to help participants maintain regular exercise through mutual support. In the study by Warburton et al [28], participants sharing various experiences of exercise, such as exercise frequency, exercise time, and exercise intensity had a strong influence on performing the exercise. To perform exercise, a community organization such as a self-help group should be used to share common problems, practical information, and specific information based on experiences.
Therefore, new strategies for self-help should be considered to induce regular exercise over time. A meta analysis [27] and systematic review [28] about elderly exercise suggested the rationale as a determinant to sustain the exercise through community organization such as self-help group.

Health-related quality of life was much greater in the experimental group, which participated in the CCBEMP, based on community empowerment strategies, than in the control group over time. These results were consistent with the integrated healthy aging program utilizing community leaders for the elderly from Zgibor et al [9]. This study suggested that elderly people should share their health goals and concerns with their community, rather than with outside experts. To help the frail elderly maintain exercise, health leaders should be trained and selected from within the community. Strategies of community capacity such as building a partnership with a community leader, organization development, and community organizing can be increased through the close relationship between participants and the network. The network functions to combine personal capital, organizational resources of the community, and social capital. This intervention may result in positive behavioral changes in the community [8]. An organizational committee activity should be created to promote the goal and motivation of the exercise program. Warburton et al [28] used the committee activity to increase self-managing capabilities, and to build self-trust, which was also seen in Grim et al [22]. Geraedts et al [29] reported that participants actively taking part in the committee effectively exercised. In addition, a positive value through committee activity was associated with the outcome expectancy of regular exercise [30]. These results showed that frail elderly women with a low level of exercise may improve through personal capital, organizational resources, and social capital of the community. In addition, promoting community empowerment strategies such as leadership development, building partnerships and community organization may improve regular exercise in frail elderly women. To improve the quality of life of frail elderly women through exercise, it is necessary to develop the program tailored to their specific needs.

The most beneficial aspects of this study were the random selection of the experimental and control groups, as well as application of health physical exercise program to the control group. However, it has several limitations. First, it was designed with only a single blind study. Second, the sample from South Korean public health centers in one city may not be generalizable. Generating the results should be of some concern to the method of sampling. Therefore, more studies are needed to examine the effect of a regular exercise program by expanding the demographics of participants. Third, qualitative research is needed to evaluate changes in community empowerment of participants during intervention. Last, we also recommend further studies that examine the long-term effectiveness of exercise maintenance program for 6-month, 1-year and 2-year follow-up.

Conclusion

In this study, the experimental group that received the CCBEMP intervention had a greater change in muscular strength, static balance, muscular endurance, body fat percentage, self-efficacy, and health-related quality of life than those in the control group over time. Therefore, the CCBEMP intervention may be utilized in various areas as a tool to assist the frail elderly. Further research is necessary to develop standardized guidelines or educational materials to spread availability of the program in a community setting.

Conflicts of interest

There is no conflict of interest for this work.

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References


