The importance of exercise in the health and well-being of older adults is well recognized. A sedentary lifestyle (20 minutes of continuous exercise less than once or twice per week) has been associated with decreased ability to perform activities of daily living (Joseph, Blumenthal, Katzel, & Goldberg, 2005). In contrast, regular exercise (20 minutes of continuous exercise at least three times per week) has been associated with improved muscle strength, endurance, and stair-climbing ability (Vincent et al., 2002); decreased anger and tension and improved general mood (McLafferty, Wetzstein, & Hunter, 2004), cognitive performance (Weuve et al., 2004), and depression (Babyak et al., 2000); and decreased risk of mortality in older adults (Manini et al., 2006). Even relatively small amounts of routine physical activity have been associated with a better health-related quality of life in older adults (Stewart et al., 2003).

For individuals with osteoarthritis and rheumatoid arthritis, aquatic exercise has been associated with a number of benefits, such as reduced pain and greater joint flexion (Lee, Choi, Kim, & Lee, 1998). In addition, aquatic exercise has led to improved functional fitness, isometric strength, and performance in activities of daily living (Suomi & Collier, 2003), as well as improved quality of well-being and quality of life.

**ABSTRACT**

The purpose of this study was to identify factors influencing long-term adherence to aquatic exercise in older women with arthritis. Participants (n = 72) completed an educational program on aquatic exercise and underwent follow-up for 6 months. At follow-up, women who continued aquatic exercise (adherence group, n = 25) had significantly higher scores than women in the nonadherence group (n = 47) in exercise self-efficacy (p < 0.0001) and group cohesion based on social aspects (p = 0.009). Both groups reported experiencing similar barriers to exercise (rho = 0.78). The findings provide insights for the development of strategies to promote long-term adherence to this type of aquatic exercise. Specifically, the findings encourage the fostering of exercise self-efficacy and social group cohesion during participation in educational programs to increase long-term exercise adherence.
Despite the benefits associated with exercise, many older adults do not exercise regularly. According to a report on the prevalence of physical activity in the United States, only 36.1% of women ages 65 to 74 met the recommended levels for physical activity; this percentage dropped to 26.9% for women ages 75 and older (Macera et al., 2005).

Of those who do begin exercise programs, approximately half drop out within the first 6 months (Ettinger et al., 1997). Similar problems have been reported for older adults in Korea. For example, in a study of aquatic exercise for older adults with arthritis, 47% of the sample discontinued the exercise within the first 6 months (Kang, Kim, & Lee, 1999a). Thus, it is important to identify factors that can be used by health care professionals to influence greater adherence to exercise.

The purpose of this study was to identify factors influencing long-term exercise adherence in Korean older women with arthritis. Specifically, the study examined the influence of self-efficacy, group cohesion, and perceived barriers to exercise on long-term adherence (6 months or longer) to an aquatic exercise program.

Several studies have found self-efficacy has a positive effect on exercise adherence in older adults in the United States (Litt, Kleppinger, & Judge, 2002; Resnick,
Previous research conducted in the United States has shown a negative relationship between perceived barriers to exercise and exercise adherence in older adults (Conn, 1998). Wilcox et al. (2006) used focus group methodology to identify barriers to exercise in 68 adults with arthritis. Exercise participation was assessed through self-report and did not specifically focus on aquatic exercise. Nonexercisers were more likely than exercisers to describe themselves as physically unable to exercise and unskilled in exercise. Both exercisers and nonexercisers identified lack of an exercise partner as a barrier. However, this was more common among nonexercisers, who stated that without exercise partners, the frequency of their exercise decreased. The lack of exercise programs and facilities also was identified as a barrier for both groups.

**METHOD Design**

This study was a cross-sectional descriptive study that focused on identifying the factors influencing adherence to exercise for at least 6 months after participants completed a structured exercise program. Participants were older Korean women with arthritis (n = 72) who had completed a structured 6-week educational program in aquatic exercise in a group setting. Women who continued aquatic exercise three times per week (adherence group) were compared with those who did not continue aquatic exercise (nonadherence group).

Data were collected from participants 6 months after completion of the educational program by structured interview. A period of 6 months was chosen for this study because individuals are considered to be in a maintenance stage of a behavior (such as exercise) when it has been sustained for this time period or longer (Prochaska & DiClemente, 1992).

**Sample**

Inclusion criteria for the study were women ages 60 or older who had completed the 6-week aquatic educational exercise program, had a diagnosis of rheumatoid arthritis or osteoarthritis confirmed by their physician, and resided in one of the urban cities in Korea in which the study was conducted. The 6-week aquatic program was recommended to participants by their physician; however, participants decided themselves whether to participate.

Seventy-two women met the inclusion criteria and underwent follow-up for at least 6 months after completing the educational program. Twenty-five women continued regular aquatic exercise, defined as participation three times per week (adherence group), and 47 women did not exercise at all (nonadherence group).

**Instruments**

The instruments, which originally were developed in English, were translated into Korean by a bilingual researcher and confirmed.
by a bilingual nursing professor for content and semantic equivalence.

Exercise Self-Efficacy. For this study, the aquatic exercise self-efficacy scale was developed by Kang (2001) to measure exercise self-efficacy (8 items) for aquatic exercise in patients with arthritis. This instrument was based on the exercise self-efficacy instruments of Sallis, Pinski, Grossman, Patterson, and Nader (1988) and the instrument of Dzewaltowski (1989). However, these instruments are not specific to aquatic exercise self-efficacy or arthritis. Kang (2001) based the new scale on these two instruments, as well as her research in aquatic exercise in patients with arthritis (Kang et al., 1999a).

Content validity of the new scale was supported when three nursing professors, who were experts in aquatic exercise, reviewed the items and judged them to be relevant. Internal validity for the new scale was supported by Cronbach’s alphas of 0.94 when used with Korean participants in a previous study (Kang, 2001) and 0.94 for the current study.

The instrument consists of 8 items asking participants to rate their level of confidence that they would continue to exercise. Participants rate their confidence on a scale of 10 (no confidence) to 100 (very confident), with higher scores indicating higher level of exercise self-efficacy. Items address the level of confidence in sustaining the exercise for at least 6 months even under the conditions of fatigue, depression, boredom, stress, over-load, dropout of peers from the program, physical difficulty, and time demands.

Group Cohesion. The Group Environment Questionnaire (GEO) originally was developed by Carron, Widmeyer, and Brawley (1985) to measure cohesion in sports teams and later was modified for the exercise domain (Carron, Widmeyer, & Brawley, 1988). The instrument

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adherence Group (n = 25)</th>
<th>Nonadherence Group (n = 47)</th>
<th>Total Sample (N = 72)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 to 64</td>
<td>9 (36)</td>
<td>19 (40.5)</td>
<td>28 (38.9)</td>
</tr>
<tr>
<td>65 to 69</td>
<td>10 (40)</td>
<td>16 (34)</td>
<td>26 (36.1)</td>
</tr>
<tr>
<td>70 to 74</td>
<td>4 (16)</td>
<td>9 (19.2)</td>
<td>13 (18.1)</td>
</tr>
<tr>
<td>≥75</td>
<td>2 (8)</td>
<td>3 (6.3)</td>
<td>5 (6.9)</td>
</tr>
</tbody>
</table>

Type of arthritis

<table>
<thead>
<tr>
<th>Type of arthritis</th>
<th>Adherence Group (n = 25)</th>
<th>Nonadherence Group (n = 47)</th>
<th>Total Sample (N = 72)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than high school</td>
<td>14 (80)</td>
<td>28 (59.6)</td>
<td>42 (58.3)</td>
</tr>
<tr>
<td>High school or college</td>
<td>11 (44)</td>
<td>18 (38.3)</td>
<td>29 (40.3)</td>
</tr>
<tr>
<td>Missing data</td>
<td>0 (0)</td>
<td>1 (2.1)</td>
<td>1 (1.4)</td>
</tr>
</tbody>
</table>

Duration of illness

<table>
<thead>
<tr>
<th>Duration of illness</th>
<th>Adherence Group (n = 25)</th>
<th>Nonadherence Group (n = 47)</th>
<th>Total Sample (N = 72)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 years</td>
<td>5 (20)</td>
<td>10 (21.3)</td>
<td>15 (20.8)</td>
</tr>
<tr>
<td>≥5 years</td>
<td>6 (24)</td>
<td>9 (19.1)</td>
<td>15 (20.8)</td>
</tr>
<tr>
<td>Could not remember</td>
<td>14 (56)</td>
<td>28 (59.6)</td>
<td>42 (58.3)</td>
</tr>
</tbody>
</table>

Note. Percentages do not equal exactly 100 due to rounding.

Exercise self-efficacy

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>t (df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise self-efficacy</td>
<td>81.66 (14.04)</td>
<td>-4.57 (70)</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>

Group cohesion

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>t (df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATG-T</td>
<td>7.53 (1.62)</td>
<td>-1.43 (70)</td>
<td>0.159</td>
</tr>
<tr>
<td>ATG-S</td>
<td>7.14 (1.29)</td>
<td>-2.68 (70)</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Exercise barriers

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>t (df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise barriers</td>
<td>0.78 (0.56)</td>
<td>2.41 (70)</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Note. ATG-T = individual attraction to the group based on the task itself (exercise); ATG-S = individual attraction to the group based on social aspects. Higher scores indicate greater exercise self-efficacy, group cohesion, and exercise barriers.
consists of two 4-item scales: one for the individual’s attraction to the group based on social aspects (ATG-S) and the other for the individual’s attraction to the group based on the task itself (ATG-T). Items are scored on a 9-point scale ranging from 1 (strongly disagree) to 9 (strongly agree). Possible ATG-S and ATG-T scores range from 4 to 36, with higher scores indicating a higher level of group cohesion.

Estabrooks and Carron (1999) reported Cronbach’s alphas of 0.68 for the ATG-T and 0.71 for the ATG-S in older adults. Brawley, Carron, and Widmeyer (1987) reported concurrent, predictive, and construct validity for the GEO. Kang (2001) modified the GEO for aquatic exercise in arthritis patients and pilot tested the instrument. For Korean adults with arthritis, Kang (2001) reported alphas of 0.65 for the ATG-T and 0.67 for the ATG-S, respectively. Cronbach’s alphas for the current study were 0.50 for the ATG-T and 0.60 for the ATG-S.

**Exercise Barriers.** The measure of perceived barriers to aquatic exercise was developed by Kang (2001) and was based on the San Diego Health and Exercise Survey (Sallis et al., 1989) and a study of aquatic exercise in Korean adults (Kang, Kim, & Lee, 1999b). Participants were asked to respond to 10 items, each of which is a potential barrier to aquatic exercise. Each item is scored on a 5-point scale ranging from zero (not at all) to 4 (very frequently). Total possible scores range from 0 to 40, with higher scores indicating a higher level of perceived barriers to exercise. Cronbach’s alphas for this measure were 0.72 when used with Korean adults (Kang, 2001) and 0.77 for the current study.

**Procedure**

All participants completed a 6-week educational program about aquatic exercise at least 6 months prior to participating in this study. The educational program was developed by Kim (1994) and adopted as the formal education program of the Korean Rheumatology Health Professionals society. The program was a comprehensive aquatic exercise program that was conducted three times per week for 6 weeks in a regular swimming pool. The program included therapeutic joint exercises in the water, and self-help group activities and strategies to promote self-efficacy.

Participants were told they should continue the aquatic exercise on their own after completing the program. A team leader, who also was a participant, encouraged other participants to continue exercising after the 6-week program ended. In addition, a nurse, who was certified to teach aquatic exercise, assisted the participants in continuing to exercise and monitored their progress.

To determine long-term exercise adherence, two sources of information were obtained. The team leader maintained a table of weekly attendance at the swimming pool during the 6-month period. Each month, the aquatic exercise nurse reviewed and confirmed the weekly attendance record kept by the team leader. In addition, swimming pool

---

**TABLE 3**

<table>
<thead>
<tr>
<th>Exercise Barrier</th>
<th>Adherence Group (n = 25)</th>
<th>Nonadherence Group (n = 47)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rank</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>There is no convenient facility or place</td>
<td>1</td>
<td>1.36 (1.70)</td>
</tr>
<tr>
<td>Exercise time is not appropriate</td>
<td>2</td>
<td>1.24 (1.48)</td>
</tr>
<tr>
<td>Transportation to the swimming pool is a problem</td>
<td>3</td>
<td>1.00 (1.44)</td>
</tr>
<tr>
<td>Difficult to do aquatic exercise in bad weather</td>
<td>4</td>
<td>0.92 (1.19)</td>
</tr>
<tr>
<td>Have no time to exercise</td>
<td>5</td>
<td>0.79 (1.10)</td>
</tr>
<tr>
<td>Have excessive workload from job, household chores,</td>
<td>6</td>
<td>0.76 (88)</td>
</tr>
<tr>
<td>and social activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worried about potential injury</td>
<td>7</td>
<td>0.72 (98)</td>
</tr>
<tr>
<td>Uncomfortable to change into swimming suit</td>
<td>8</td>
<td>0.44 (96)</td>
</tr>
<tr>
<td>The cost of aquatic exercise is burdensome</td>
<td>9</td>
<td>0.36 (64)</td>
</tr>
<tr>
<td>Difficult to do aquatic exercise</td>
<td>10</td>
<td>0.24 (52)</td>
</tr>
</tbody>
</table>

Note. Rankings are ordered from most (1) to least (10) frequently encountered barrier. Higher mean item scores indicate more frequently encountered barriers to exercise.
records were checked to determine whether participants had purchased the monthly ticket for admission to the swimming pool.

To participate in this study, both the weekly attendance and admission records needed to be in agreement. The study was limited to women who were exercising regularly three times per week (adherence group) and those who were not exercising at all (nonadherence group). Women who exercised sporadically were excluded from this study because their exercise performance was widely variable and inconsistent, making it difficult to characterize in an accurate manner.

One structured interview was conducted to collect data from participants. Prior to the initiation of data collection, the study received approval from Kongju National University for ethical conduct of research.

**Data Analysis**

The two groups compared in this study (adherence and nonadherence groups) were formed naturally by the participants, as determined by the frequency of participation in aquatic exercise; there was no assignment to groups. Chi-square tests were used to compare demographic data between the adherence and nonadherence groups. Mean scores for self-efficacy, group cohesion, and exercise barriers were compared between the two groups using t tests.

**RESULTS**

**Sample Characteristics**

Table 1 shows characteristics of the sample. Participants were women with a mean age of 66.14 (SD = 4.60, age range = 60 to 78). Approximately two thirds had a high school education or less.

Osteoarthritis was the most common diagnosis (83.3%), with the remainder having rheumatoid arthritis. The majority had been diagnosed with arthritis for longer than 5 years; many could not remember the exact number of years but stated they had had arthritis for a long time.

There were no significant differences between the two groups in age, education, type of arthritis, or duration of illness. All of the participants lived in urban areas.

**Comparison of the Adherence and Nonadherence Groups**

The mean scores for the two groups for self-efficacy, group cohesion, and exercise barriers are shown in Table 2. Mean scores were significantly higher for the adherence group than the nonadherence group for exercise self-efficacy and group cohesion based on social aspects. However, group cohesion based on the task itself was not significantly different between the two groups.

The mean scores for barriers to exercise also were not significantly different between the groups. Because of the clinical importance of barriers to exercise, the individual barriers were examined further. Barriers were ranked in terms of how much of a problem they were for the two groups (Table 3). A Spearman rank-order correlation of 0.78 between the rankings of the two groups showed they were similar regarding the barriers considered the most problematic. The most common barriers for both groups were inconvenience of pool location and the time needed to reach to the pool (e.g., transportation availability, having no time to exercise, bad weather).

**DISCUSSION**

The purpose of this study was to identify factors influencing aquatic exercise adherence for 6 months or longer in older Korean women with arthritis. The findings showed exercise self-efficacy was significantly higher in the group that exercised regularly for 6 months. These findings are similar to studies of older American women. For example, in a study of 20 minutes of continuous aerobic exercise (i.e., swimming, walking, jogging, biking), Resnick et al. (2002) found self-efficacy was positively related to long-term exercise adherence for 155 older women living in a continuing care retirement community.

In another study of 189 older women who had been diagnosed with low bone density, Litt et al. (2002) found maintenance of exercise was predicted by self-efficacy for exercise. In addition, exercise behavior at 12 months was predicted by social support for exercise.

In the current study, exercise adherence was influenced more by the social aspects of group cohesion than interest in the exercise itself. This differs from findings in young American adults, which showed the task component of group cohesion (exercise itself) influenced exercise adherence more than the social aspects (Carron & Spink, 1993; Spink & Carron, 1993).
KEYPOINTS

AQUATIC EXERCISE ADHERENCE


1. After completing an aquatic exercise program, older Korean women with arthritis who continued to exercise regularly during the next 6 months had significantly higher exercise self-efficacy than those who did not.

2. Long-term exercise adherence was influenced more by the social aspects of group cohesion than interest in the exercise itself.

3. Perceived barriers to aquatic exercise were similar for both women who continued to exercise and those who did not, indicating self-efficacy and social aspects of group cohesion were sufficiently strong in the adherence group to enable women to overcome barriers.

4. The findings suggest fostering exercise self-efficacy and social bonds during participation in aquatic exercise programs may promote long-term adherence to exercise in older women.

However, the findings of this study are similar to those of Estabrooks and Carron (1999), who found older American adults were initially attracted to exercise classes as a new social opportunity and felt united in the socialization that occurs during or following the classes. This was also true in the current study, as participants stated they were able to continue longer when they were members of a group, rather than exercising alone. Participants also stated exercising with a close friend was helpful in sustaining exercise. Conversely, participants reported strained relationships with friends negatively influenced sustaining exercise. Thus, social bonding and friendships were determining factors for continuing exercise in this study, as well as dropping out.

Social aspects of exercise would be expected to be particularly salient for Korean women, perhaps even more so than for American women, because of the collectivistic nature of their culture. Korean and other Asian societies tend to emphasize social connectedness and the importance of the group to a much greater extent than American culture, which places more importance on individuality and independence (Vandello & Cohen, 1999). Promoting the social aspects of exercise may be a particularly important strategy for encouraging long-term adherence in Korean women.

It was interesting that the perceived barriers to aquatic exercise were similar in both the adherence group and the nonadherence group. The implications are that the effects of self-efficacy and social aspects of group cohesion were sufficiently strong in the adherence group to enable women to overcome these barriers. Thus, the presence or absence of perceived barriers was not the critical determinant of long-term exercise adherence. These findings have implications for clinical practice, indicating that fostering self-efficacy and social bonds are promising components for interventions designed to increase long-term participation in aquatic exercise.

Although rheumatoid arthritis and osteoarthritis are different disease processes, women with both types of arthritis were included in this study. The question to consider is whether the findings are valid even though women with these two types of arthritis were combined in the adherence and nonadherence groups.

First, women with both types of arthritis participated together in a mixed group in the original educational program about aquatic exercise. All of the participants in the study were physically able to complete the program, which included exercising in the pool, and so were similar to that extent.

Second, the study examined the characteristics of the naturally occurring groups of those who continued to exercise regularly and those who did not. The proportions of women with osteoarthritis versus rheumatoid arthritis were remarkably similar in the adherence and nonadherence groups (80% osteoarthritis in the adherence group versus 85% osteoarthritis in the nonadherence group, chi square = 0.31, df = 1, p < 0.75). These findings suggest the type of arthritis did not play a significant role in the results of this study.

Finally, in community exercise programs, women with different types of arthritis commonly exercise together, as they did in the original aquatic program in this study. Because this study was a follow up of the women who participated in that program, it provides a reflection of routine practice.

NURSING IMPLICATIONS

In light of the fact that studies have shown regular physical activ-
Cohesion, other variables may have been different between the two groups. Assessment of these additional variables before participation in the 6-week educational program would have demonstrated whether other differences between the two groups may have affected continuation of exercise. For example, pre-existing exercise habits, participation in other types of exercise, and comorbidities hindering exercise could affect long-term adherence to aquatic exercise, and should be examined in future studies.

Third, because the levels of exercise self-efficacy and the social aspects of group cohesion before participating in the educational program were not known, it cannot be determined whether these variables were changed as a result of participation in the program. In future research, it would be important to explore how sensitive exercise self-efficacy and the social aspects of group cohesion are to change as a result of participation in a program promoting aquatic exercise.

CONCLUSION
In this study of women who completed an educational program about aquatic exercise, the social aspects of exercise influenced long-term adherence more than interest in the exercise itself. Barriers to exercise were not the critical determinants for dropping out because the barriers were similar in both groups of women. Instead, the most powerful influence was social bonding and friendships, which kept the women continuing with regular aquatic exercise for 6 months. The findings of this study provide insights for the development of strategies to promote long-term adherence to aquatic exercise through fostering exercise self-efficacy and social group cohesion.

REFERENCES


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