Using Physical Activity to Manage Pain in Older Adults

Kelli F. Koltyn

Chronic pain is a significant problem for many older adults. Strategies for pain management appear to be limited, with the prescription of analgesic medication used most often to treat pain. Older adults, however, are often sensitive to adverse side effects from analgesic medications, so nonpharmacological strategies for treating pain are receiving increased attention. This review article summarizes results from studies that have examined whether improvements in pain occur after an exercise intervention. Limited research has been conducted, and it can be characterized as both experimental and quasi-experimental. In addition, pain has usually been a secondary variable assessed in conjunction with a number of other variables. Results from most studies indicate that improvement in pain can occur after exercise training, but several investigators did not find changes in pain after an exercise-training program. Even less research has been conducted with older adults residing in assisted-care facilities, and this research is limited by small sample sizes.

Key Words: exercise, analgesia, assisted care

As the population of the United States ages, the problems posed by chronic and disabling conditions demand increased attention (Healthy People 2000, 1990). Pain has a negative impact on millions of individuals each year, and with an increasingly rapid growth of the older adult population, pain-related complaints will continue to increase. It has been reported that 40–50% of older adults suffer from chronic pain (Harkins, Kwentus, & Price, 1990; Klippel, 2000), and it is now felt that pain is a critical national health problem (National Institutes of Health, 1995). Pain is the most common reason for medical appointments, and it can have a detrimental effect on mobility, overall functional status, immune function, sleeping and eating patterns, and psychological well-being (Crook, Rideout, & Browne, 1984; Gureje, Vonkorff, Simon, & Gater, 1998; Liebeskind, 1991; Scudds & Robertson, 1998).

It has been suggested that physical activity can improve pain management in older adults (Ettinger et al., 1997; Ferrell, 1991; Fuchs & Zaichkowsky, 1997; Minor, 1991). In fact, the American Geriatrics Society Panel on Chronic Pain (1998) has recommended that physical activity be included in the care of all older

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adults troubled by chronic pain. In the past, individuals with chronic pain were instructed to limit their physical activity, and it has been reported that most individuals suffering from chronic pain tend to be inactive for extended periods of time (Bortz, 1984; Williamson & Schulz, 1992). Physical inactivity is associated with increased risk for developing a number of degenerative and chronic medical conditions (Minor, Hewett, Webel, Anderson, & Kay, 1989). A number of documents have been published addressing prevention objectives and health-status goals for older adults, and physical inactivity has been recognized to be an important risk factor in determining their health (Healthy People 2000, 1990; U.S. Department of Health and Human Services, 1996). Participation in regular physical activity elicits a number of favorable responses that contribute to healthy aging. Some of the benefits that have been attributed to regular physical activity include minimizing biological changes associated with aging, reversing disuse syndromes, controlling chronic diseases, maximizing psychological health, increasing mobility and function, and assisting with rehabilitation from acute and chronic illness (American College of Sports Medicine, 1998). Despite the positive benefits of regular physical activity, it has been estimated that 69–70% of older adults do not engage in it (Clark, 1995; Goggin & Morrow, 2001; Kovar et al., 1992).

The purpose of this article is to summarize the research that has been conducted examining whether improvements in pain occur after an exercise intervention. One previous review chapter has been published summarizing results from research that has used exercise in an attempt to control pain, as well as to manage diseases, to maintain good health, and in rehabilitation (Fuchs & Zaichkowski, 1997). In addition, there have been two review articles published summarizing research that has been conducted specifically examining the role of exercise in the management of arthritis pain (Ettinger & Afable, 1994; Minor, 1991). The objective of the current article is to update, summarize, and focus on research that has examined the effectiveness of exercise to manage a variety of painful conditions in older adults. This review includes research that has been conducted with community-dwelling older adults, as well as older adults residing in assisted-care facilities. The criteria for including studies in this review were as follows: participants 60 years of age and older, use of a physical activity or exercise intervention, and some type of pain assessment. Three databases were searched: MEDLINE, PsychLit, and SPORTDiscus. Articles were identified in three main categories, so this article is organized into the following corresponding sections: (a) community-dwelling older adults with various painful conditions, (b) community-dwelling older adults with osteoarthritis pain, and (c) older adults residing in assisted-care facilities with various painful conditions.

Community-Dwelling Older Adults
With Various Painful Conditions

A limited number of studies have been conducted examining the association between physical activity and various painful conditions in community-dwelling older adults (see Table 1). This research can be characterized as both experimental and quasi-experimental, and pain was usually a secondary variable assessed in conjunction with a number of other variables. In one of the experimental studies that was conducted in this area, Ferrell, Josephson, Pollan, Loy, and Ferrell (1997)
randomly assigned 33 veterans (mean age = 73 years) with various chronic pain conditions including back pain, knee pain, and hip pain to a walking group, a pain-education group, or a usual-care control group. Individuals assigned to the walking group performed supervised low-intensity walking four times a week for 6 weeks, whereas the pain-education group received a 90-min educational session focusing on instruction and demonstration of nonpharmacological pain interventions including heat, cold, massage, relaxation, and distraction. Individuals assigned to the control group were instructed to continue treatments prescribed by their primary-care physicians. All participants were assessed at baseline, after the orientation session, and after the 6-week interventions on pain (patient pain questionnaire) and functional performance tests. Results indicated significant improvements in pain and functional status in the walking and education groups after the 6-week interventions compared with no change in the control group.

Agre, Pierce, Raab, McAdams, and Smith (1988) examined the effects of light resistance exercise on upper and lower body strength in older women. Forty-seven women with a mean age of 71 years were assigned to three groups. Women who agreed to delay their exercise program for 6 months were assigned to a control group, while the rest of the women were randomly assigned to either an exercise group that used weights or an exercise group that did not. Participants assigned to the exercise groups completed 1 hr of strength training and flexibility exercises.

Table 1 Summary of Studies Examining Changes in Painful Conditions After Exercise Intervention in Community-Dwelling Older Adults

<table>
<thead>
<tr>
<th>Authors</th>
<th>Participants</th>
<th>Groups</th>
<th>Duration</th>
<th>Results</th>
</tr>
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<tbody>
<tr>
<td>Ferrell et al.</td>
<td>33 veterans</td>
<td>1. walking</td>
<td>6 wk</td>
<td>Pain decreased in the walking and education</td>
</tr>
<tr>
<td>(1997)</td>
<td>(73 yr)</td>
<td>2. education</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agre et al.</td>
<td>47 women</td>
<td>1. exercise with weights</td>
<td>25 wk</td>
<td>59% of exercisers had an improvement in joint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. control group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khalil et al.</td>
<td>1. 30 (70 yr)</td>
<td>1. active</td>
<td>1.4 wk</td>
<td>Decrease in pain with active physical</td>
</tr>
<tr>
<td>(1994)</td>
<td>2. 29 (66 yr)</td>
<td>2. passive</td>
<td>2.2 wk</td>
<td>restoration.</td>
</tr>
<tr>
<td>Chow et al.</td>
<td>90 women</td>
<td>1. exercise</td>
<td>24 mo</td>
<td>Exercise group had a decrease in low back</td>
</tr>
<tr>
<td>(1989)</td>
<td>(66.5 yr)</td>
<td>2. sedentary</td>
<td></td>
<td>pain.</td>
</tr>
<tr>
<td>King et al.</td>
<td>103 (70 yr)</td>
<td>1. Fit &amp; Firm exercise</td>
<td>12 mo</td>
<td>Pain decreased in the Stretch &amp; Flex group.</td>
</tr>
<tr>
<td>(2000)</td>
<td></td>
<td>2. Stretch &amp; Flex exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ross et al.</td>
<td>17 (68–92 yr)</td>
<td>Tai Chi</td>
<td>8 wk</td>
<td>Decrease in pain.</td>
</tr>
<tr>
<td>(1999)</td>
<td></td>
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three times a week for 25 weeks. Strength testing was completed on all three groups before and after the 25-week program, and joint pain (questionnaire) was assessed at the end of the 25-week program in the exercise groups. Results indicated that joint pain was present in 83% of the participants in the exercise groups before the exercise program began. Fifty-nine percent had a decrease in joint pain after exercise training, 34% had no change in joint pain, and 7% had an increase in joint pain after 25 weeks of exercise training. No statistical analyses were performed on the joint-pain data, so it is unclear whether the changes in joint pain were significant. Also, it appears that joint pain was not assessed in the control group, so it is unclear whether pain increased or decreased over time in that group.

Several quasi-experimental studies have been conducted in this area. Khalil, Abdel-Moty, Diaz, Steele-Rosomoff, and Rosomoff (1994) examined the effectiveness of two different types of physical restoration programs (active and passive) in improving the performance of older adults with a variety of chronic pain conditions. Convenient samples of patients were tested in this study, with no random assignment to the two groups. Individuals (11 men and 19 women with a mean age of 70 years) who completed the active intervention participated in 4 weeks of physical and balance exercises. Daily sessions consisted of combinations of resistance exercise, flexibility exercise, postural exercise, and balance and gait exercises. The passive-conditioning program consisted of functional electrical stimulation to strengthen weak muscles. Twenty-nine patients (13 women and 16 men, mean age = 66 years) were treated with functional electrical stimulation on a daily basis for 2 weeks. Separate analyses were completed for the two interventions, and results indicated that individuals who performed the active intervention had a significant decrease in pain (pain-rating scale) after the 4-week program, as well as a significant increase in strength. The individuals who participated in the passive-treatment intervention had a significant increase in strength in the muscle that was treated, but it does not appear that pain was measured in this group.

In an observational study, 90 women with osteoporosis (mean age = 66.5 years) were followed for 2 years by Chow, Harrison, and Dorman (1989), who examined whether women who exercised differed on selected variables from women who did not exercise. Women with osteoporosis were referred by their physicians to a rehabilitation program in which bone mass, aerobic capacity, and pain (visual analog scale) were initially assessed. Women were encouraged and trained to exercise at least three times per week, and recommendations regarding exercise included 30 min of strengthening exercises and 30 min of aerobic exercise. Two years after the initial referral to the rehabilitation program, women were again assessed on bone mass, aerobic capacity, and pain. Fifty-three women who reported exercising at least three times per week and had a significant improvement in aerobic capacity were designated as “exercisers.” Thirty-seven women who reported not exercising and had no improvements in aerobic capacity were designated as “nonexercisers.” The exercisers were found to have a significant increase in bone mass compared with the nonexercisers. In addition, they had significant improvements in back pain compared with the nonexercisers, who reported increases in back pain.

Two studies have been conducted reporting changes in pain after an exercise-training program; however, information is not provided on the kind of pain that participants were experiencing. In one of the studies, King et al. (2000) examined
the effects of two exercise programs on physical functioning and health-related quality of life in older adults. One hundred three adults (mean age = 70 years) were randomly assigned to an endurance and strength-training program (Fit & Firm) or a stretching and flexibility program (Stretch & Flex). Participants in both exercise groups completed 12 months of exercise training in a combination of class and home-based exercise formats. Participants assigned to the Fit & Firm group completed a combination of aerobic, strength, and muscle-toning exercises, and participants assigned to the Stretch & Flex group completed a variety of stretching exercises. Endurance, upper and lower body strength, flexibility, perceived functioning (including bodily pain), and well-being were assessed before and after 6 and 12 months after the exercise interventions. Significant improvements in strength and endurance were found at 12 months in the Fit & Firm group compared with the Stretch & Flex group. Participants in the Stretch & Flex group, however, had significant improvements in bodily pain and flexibility at 12 months.

The effects of a Tai Chi exercise program on flexibility, balance, pain, and mood in older adults were examined in a quasi-experimental pilot study by Ross, Bohannon, Davis, and Gurchiek (1999). Seventeen adults between the ages of 68 and 92 years completed 50 min of Tai Chi exercise three times a week for 8 weeks. Flexibility, pain (visual analog scale), balance, and mood were assessed before and after the 8-week program. Significant improvements in pain and mood were reported, but no change in flexibility and balance were found after 8 weeks of Tai Chi exercise. It is unclear, however, without a control group, whether pain would have decreased across time without participating in a Tai Chi exercise program.

Results seem to indicate that participation in an exercise-training program is associated with reductions in pain in older adults with various painful conditions including back, hip, joint, and myofascial pain. The research in this area, however, has been predominantly quasi-experimental, with either no comparison groups or no random assignment to groups. Only one study randomly assigned participants to multiple groups including a comparison group and a control group (Ferrell et al., 1997). Results from this study indicated that pain improved in the exercise group, but pain was also found to improve in the pain-education group.

Community-Dwelling Older Adults
With Osteoarthritis Pain

Most of the research conducted in this area has examined the influence of exercise on pain associated with osteoarthritis in older adults; however, pain was usually a secondary variable of interest. Ettinger et al. (1997), for example, examined two types of exercise (aerobic and resistance) to determine their effects on disability, physical performance, and pain in older adults with osteoarthritis of the knee. Four hundred thirty-nine community-dwelling older adults (60 years and older) were randomly assigned to an aerobic-exercise program, a resistance-exercise program, or a health-education program. All participants completed 3-month facility-based programs and then 15-month home-based programs. Individuals assigned to the aerobic-exercise program completed 1 hr of aerobic exercise three times per week, consisting of walking at an intensity between 50% and 70% of heart-rate reserve (HRR). The resistance-exercise program consisted of lifting weights for 1 hr three times per week. Individuals assigned to the health-education group completed
education sessions for 1 and one half hr per month for the first 3 months and then received telephone calls biweekly for the next 15 months. Self-reported disability and knee pain were assessed with scales designed for this study, and physical-performance tests were also completed before and after the various interventions. Results indicated that both exercise groups reported less disability and pain than did the health-education group. In addition, physical performance was higher in both exercise groups than in the health-education group.

Coleman, Buchner, Cress, Chan, and deLateur (1996) examined the effects of exercise on joint symptoms in older adults. One hundred five adults with a mean age of 75 years were randomly assigned to an endurance-training group, a strength-training group, a combined endurance- and strength-training group, or a control group. The exercise interventions consisted of supervised exercise for 1 hr three times a week for 24–26 weeks. Isokinetic strength, health status, joint symptoms, and bodily pain (SF-36) were assessed at baseline and after the 6-month programs. Results indicated that joint symptoms fluctuated over time in all of the exercise groups, but joint symptoms did not improve or worsen significantly in any of the groups after the 6-month interventions. Health status and bodily pain also were not found to change in any of the groups after 6 months.

Kovar et al. (1992) examined the effects of a program of supervised walking and patient education on functional status, pain, and medication use in older adults with osteoarthritis of the knee. One hundred two individuals with knee osteoarthritis (mean age = 69 years) were randomly assigned to a walking and education group or to a control group. Individuals assigned to the walking and education group completed an 8-week hospital-based program. Participants met for 90 min three times per week, and each session consisted of lectures, group discussions, and up to 30 min of walking. Individuals assigned to the control group were telephoned each week to discuss activities of daily living. Functional status was assessed with a 6-min-walk test and the Arthritis Impact Measurement Scale (AIMS). Pain and medication use were also assessed with the AIMS. Results indicated that the walking and education group improved in functional status and pain, compared with no change in the control group. Medication use was not found to change significantly for either group.

Schilke, Johnson, Hush, and O’Dell (1996) examined whether an 8-week strength-training program improved the functional health status of older adults with osteoarthritis of the knee. Twenty adults (mean age = 65 years) were randomly assigned to a strength-training group (n = 10) or a control group (n = 10). Strength training consisted of isokinetic muscle-strength exercises performed three times a week for 8 weeks. Strength, functional performance, mobility, and pain (OASI questionnaire) were assessed before and after the 6-week program. Results indicated a significant decrease in pain and stiffness and a significant increase in mobility in the strength-training group compared with no change in the control group.

Minor et al. (1989) examined the effectiveness of three exercise programs on disease status and physical and psychological functioning in adults with rheumatoid or osteoarthritis. One hundred twenty adults with either rheumatoid arthritis (n = 40, mean age = 54 years) or osteoarthritis (n = 80, mean age = 64 years) were randomly assigned to either a walking group, an aquatic-exercise group, or a range-of-motion (ROM) exercise group. Participants completed 1 hr of exercise three times a week
for 12 weeks. Exercise tolerance, disease status (including pain), physical function, and psychological function were assessed before and after the 12-week interventions. The aquatic-exercise and walking groups had significant improvements compared with the ROM group in aerobic capacity, physical function, depression, anxiety, and pain scores after the 12-week program.

Mangione et al. (1999) examined the effects of stationary cycling on functional status, mobility, and pain in older adults with a diagnosis of osteoarthritis of the knee. Thirty-nine adults (mean age = 71 years) were randomized to either a low-intensity (40% HRR) or a high-intensity (70% HRR) exercise group. Participants cycled for 25 min three times a week for 10 weeks. Functional status, mobility, and pain (VAS, WOMAC, and AIMS-2) were assessed before and after the 10-week intervention. Both groups were found to have significant improvements in overall pain, functional status, and mobility after the exercise-training program, but results did not differ between the high- and low-intensity groups.

Using a quasi-experimental design, Fisher, Gresham, and Pendergast (1993) examined the effects of a supplemental progressive-exercise rehabilitation program that was added to a physical therapy program already in place. Forty adults (mean age = 64 years) with osteoarthritis of the knee were randomly selected from a group of volunteers to complete a 3-month exercise rehabilitation program consisting of isometric and isotonic resistance exercise prescribed in a progressive sequence. Each exercise session was held immediately after 1 hr of physical therapy. Muscle strength and endurance, functional capacity, and pain encountered with activities of daily living (Jette Functional Status Index) were assessed before and after the exercise rehabilitation program. Results indicated that muscle strength and endurance increased significantly and pain associated with activities of daily living decreased significantly after the supplemental exercise rehabilitation program.

Results from most of the studies that have been conducted in this area indicate that exercise training can improve osteoarthritis pain (Ettinger et al., 1997; Fisher et al., 1993; Kovar et al., 1992; Mangione et al., 1999; Minor et al., 1989; Schilke et al., 1996; see Table 2). One study, however, did not find such improvements (Coleman et al., 1996). It is unclear why Coleman et al. did not find improvements in osteoarthritis pain after exercise training when most of the other investigators did. Inconsistent results might be the result of different exercise-training programs or different pain-assessment tools used in the various studies.

### Older Adults Residing in Assisted-Care Facilities With Various Painful Conditions

Pain is a major problem for older adults residing in long-term-care facilities. It has been estimated that 45–80% of nursing-home residents have substantial pain that often goes untreated (American Geriatrics Society, 1998; Ferrell, 1995; Ferrell, Ferrell, & Osterweil, 1990). Very little research, however, has been conducted examining the association between exercise training and pain management in older adults residing in assisted-care facilities (see Table 3). One study examined the feasibility of conducting a group-based strength-training program for residents of a multilevel-care facility (Brill et al., 1998). Sixteen adults (14 women, 2 men) with a mean age of 82 years were randomly assigned to a progressive strength-training program or a minimal-treatment exercise condition. Participants assigned to the
Table 2  Summary of Studies Examining Changes in Osteoarthritis Pain After Exercise Intervention in Community-Dwelling Older Adults

<table>
<thead>
<tr>
<th>Authors</th>
<th>Participants</th>
<th>Groups</th>
<th>Duration</th>
<th>Results</th>
</tr>
</thead>
</table>
| Ettinger et al. (1997) | 439 adults (60 yr+) | 1. aerobic exercise  
2. resistance exercise  
3. health education | 18 mo    | Decrease in pain in both exercise groups. |
| Coleman et al. (1996) | 105 adults (75 yr) | 1. strength training  
2. endurance training  
3. combination  
4. control | 24–26 wk | No change in pain for any group. |
| Kovar et al. (1992) | 102 adults (69 yr) | 1. walking and education  
2. control | 8 wk     | Pain decreased in the walking and education group. |
| Schilke et al. (1996) | 20 adults (65 yr) | 1. strength training  
2. control | 8 wk     | Decrease in pain in the group that strength trained. |
| Minor et al. (1989) | 80 adults (64 yr) | 1. walking  
2. aquatic exercise  
3. range of motion | 12 wk    | Pain decreased in the walking and aquatic-exercise groups. |
| Mangione et al. (1999) | 39 adults (71 yr) | 1. high-intensity cycle  
2. low-intensity cycle | 10 wk    | Decrease in pain in both groups. |
| Fisher et al. (1993) | 40 adults (64 yr) | exercise rehab program | 3 mo     | Pain decreased after the program. |

A strength-training group completed 30 min of upper and lower body strength-training exercises using hand and ankle weights three times a week for 8 weeks. Participants assigned to the minimal-treatment group completed 30 min of calisthenics and flexibility exercises three times a week for 8 weeks. Levels of strength, functional performance, activities of daily living, and pain associated with activities of daily living (pain-rating scale) were assessed before and after the 8-week programs. Results indicated that strength increased significantly in the progressive strength-training group compared with no change in the minimal-treatment group. Functional performance was found to improve in both groups. No significant
Table 3  Summary of Studies Examining Changes in Pain After Exercise Intervention in Older Adults Residing in Assisted-Care Facilities

<table>
<thead>
<tr>
<th>Authors</th>
<th>Participants</th>
<th>Groups</th>
<th>Duration</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brill et al.</td>
<td>16 adults</td>
<td>1. strength training</td>
<td>8 wk</td>
<td>Pain decreased by 50% in group that strength trained.</td>
</tr>
<tr>
<td>(1998)</td>
<td>(82 yr)</td>
<td>2. minimal treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gutman et al.</td>
<td>67 adults</td>
<td>1. Feldenkrais exercise</td>
<td>6 wk</td>
<td>Decrease in pain in all 3 groups.</td>
</tr>
<tr>
<td>(1977)</td>
<td>(71 yr)</td>
<td>2. conventional exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atterbury et al.</td>
<td>12 adults</td>
<td>aerobic dance</td>
<td>7 wk</td>
<td>Increase in pain-free range of motion.</td>
</tr>
<tr>
<td>(1983)</td>
<td>(63–90 yr)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miller &amp; LeLievre</td>
<td>4 adults</td>
<td>prescribed physical therapy program</td>
<td>4 wk</td>
<td>55% decrease in pain medication/pain behaviors, and self-reported pain decreased.</td>
</tr>
<tr>
<td>(1982)</td>
<td>(56–98 yr)</td>
<td></td>
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</table>

Changes in pain associated with activities of daily living were found for either group, but small sample size might have limited the power to detect significant changes. Closer inspection of the data indicated that pain had decreased by approximately 50% in the group that completed 8 weeks of progressive strength training.

Gutman, Herbert, and Brown (1977) examined the effects of two exercise programs on balance, flexibility, activities of daily living, and pain in residents of retirement centers. Residents from two retirement centers (mean age = 71 years) were recruited to participate in this study. Residents from one of the centers were randomly assigned to a conventional exercise program (n = 13) or to a control group (n = 16), and participants from the other were randomly assigned to a Feldenkrais exercise group (n = 19) or to a control group (n = 19). Participants in the exercise groups completed 1-hr exercise sessions three times a week for 6 weeks. Individuals assigned to the conventional exercise group completed activities such as walking and calisthenics, and individuals assigned to the Feldenkrais exercise group completed Feldenkrais exercises using movements performed mainly on floor mats. Balance, flexibility, activities of daily living, and pain (body diagram) were assessed at the beginning and end of the 6 weeks. There were no significant changes in balance and flexibility at the end of the 6-week programs. There was, however, a reduction in pain scores at the end of the program, but the degree of change did not differ between the exercise groups and the control groups.

Atterbury, Sorg, and Larson (1983) conducted a quasi-experimental pilot study to examine the impact of an aerobic-dance program on residents of a long-
term-care facility. Twelve adults (63–90 years old) residing in a long-term-care facility completed a 7-week exercise program. Exercise consisted of 30–45 min of aerobic dance two times per week. The investigators reported that by the end of the seventh week “residents demonstrated increases in pain-free ranges of motion, improved psychological feelings of well-being, and a sense of accomplishment” (p. 72). It is unclear, however, what assessments were completed because no information is provided on the tools used to assess pain, well-being, or sense of accomplishment. Also, no statistical analyses are presented, so it is not known whether the changes that were reported to occur were significant.

The association between exercise and pain in residents of long-term-care facilities was examined in an observational study by Miller and LeLievre (1982). Four adults ranging in age from 56 to 89 years participated in a prescribed physical therapy program consisting of stretching and ROM exercises for 20-min sessions. The amount of pain medication used, the number of pain behaviors exhibited, and self-reported pain (McGill pain questionnaire) were assessed before and after the physical therapy program. A 55% reduction in total intake of pain medication was reported after the physical therapy program. Pain behaviors and self-reported pain were also found to decrease after the physical therapy program, but statistical analyses were not performed, so it is unclear whether the changes observed were significant.

Very little research has been conducted examining the association between exercise and pain in older adults residing in assisted-care facilities, and the research that has been done is limited by small sample sizes. In one study that had a larger sample size (Gutman et al., 1977), pain was found to decrease after two different exercise training programs, but pain also decreased in the control group. Currently, it is unclear whether exercise is capable of reducing pain in older adults residing in assisted-care facilities.

Discussion

Chronic pain is a significant problem for many older adults. Approximately 40–50% of older adults report suffering from chronic pain (Klippel, 2000), and estimates indicate even higher rates of pain (45–80%) among older adults residing in assisted-care facilities. The consequences of chronic pain among older adults are numerous and include impairments in mobility, overall functional status, immune function, sleeping and eating patterns, and psychological well-being (Crook et al., 1984; Gureje et al., 1998; Liebeskind, 1991; Scudds & Robertson, 1998). In addition, increased health-care utilization and costs are associated with the presence of pain in older adults (Lavsky-Shulan, Wallace, Kahour, Morris, & Smith, 1985).

Strategies for pain management in older adults appear to be limited, with the prescription of analgesic medication used most often. Older adults, however, are often sensitive to adverse side effects from analgesic medications (Griffin, Piper, Daughter, Snowden, & Ray, 1991; Kaiko, Wallenstein, Rogers, Grabinski, & Houde, 1982), so nonpharmacological strategies for treating pain are receiving increased attention. The most common nonpharmacological strategies for treating pain include heat, cold, massage, physical therapy, and exercise. The importance of exercise training in providing a number of health benefits has been established, but less is known about the role exercise plays in relieving pain in older adults.
A limited amount of research has been conducted examining changes in a variety of painful conditions including back, knee, hip, and myofascial pain after an exercise-training intervention, but much of this research has relied on quasi-experimental designs as opposed to true experimental designs. The strongest designs and the strongest support for the effectiveness of exercise in pain management are in the area of osteoarthritis pain. A number of investigators have reported improvements in osteoarthritis pain after an exercise-training program (Ettinger et al., 1997; Fisher et al., 1993; Kovar et al., 1992; Mangione et al., 1999; Minor et al., 1989; Schilke et al., 1996), but results from one study did not indicate such improvements (Coleman et al., 1996). A wide variety of exercise-training programs have been employed in the various studies, including stretching, ROM exercises, walking, cycling, aerobic dance, Tai Chi, and resistance exercise. Currently, it is not known which kind of exercise-training program is best for managing pain in older adults. Further research is needed examining the optimal mode, intensity, duration, and frequency of exercise that are safe and effective. In addition, a wide variety of pain-assessment tools have been used, and it is unclear whether there are tools that are better than others to most accurately assess changes in pain after exercise training.

The reasons for which exercise is beneficial in reducing pain in older adults are poorly understood, but there are several plausible hypotheses. First, regular exercise is known to improve health and contribute to healthy aging, whereas physical inactivity leads to a number of adverse health consequences. Bortz (1984) has proposed a “disuse syndrome” characterized by a loss of cardiovascular reserve and muscle strength, an increase in obesity, and an increase in “musculoskeletal fragility.” Reduced muscle strength is associated with reductions in functional status (Wagner, LaCroix, Buchner, & Larson, 1992). In addition, optimal joint stability and alignment depend on muscle strength and endurance, and cartilage becomes fragile without regular motion (Minor, 1991). Reduced muscle strength, as well as compromised joint stability and cartilage, can result in an overload placed on weak muscles, which in turn can lead to muscle soreness and pain. Muscle strength can be increased with exercise training, and this increased strength reduces the load placed on muscles, which should lead to reductions in muscle soreness and pain.

In addition, research indicates that analgesia can occur after exercise (Koltyn, 2000). One popular hypothesis for why this occurs is that exercise stimulates the endogenous opioid system, but the data regarding this hypothesis are mixed. Furthermore, there has been no research examining whether the endogenous opioid system is responsible for pain reduction after an exercise-training program in older adults.

In conclusion, most of the investigations reviewed have shown that exercise-training programs appear to improve pain in community-dwelling older adults. The strongest evidence indicates a reduction in osteoarthritis pain after exercise training. Further research is necessary to understand the optimal conditions under which reductions in pain occur, as well as the underlying mechanisms responsible for the pain-relieving effects of exercise. Even less is known regarding the effectiveness of exercise in managing pain in residents of assisted-care facilities. More research is needed with larger samples of older adults residing in assisted-care facilities to determine whether exercise can be used to alleviate their pain.
References


