The Impact of Chronic Musculoskeletal Pain on Exercise Attitudes, Self-Efficacy, and Physical Activity

Suzanne G. Leveille, Jiska Cohen-Mansfield, and Jack M. Guralnik

The authors examined the relationship between musculoskeletal pain, self-efficacy, attitudes and beliefs about exercise, and physical activity in 75- to 85-year-old adults. Participants rated their pain during the preceding month in their back, hips, knees, and feet on a scale of 0 to 10. Pain was categorized by number of sites of moderate to severe pain. Among the 325 participants, 42.8% reported at least moderate pain in at least 1 site. Having more pain sites was associated with younger age, lower income, depressed mood, and poorer self-rated health. Participants with more pain sites scored lower on exercise attitudes, beliefs, and self-efficacy, but the self-efficacy scale was most strongly associated with physical activity. Participants with 2–4 pain sites and low self-efficacy were >4 times as likely to be sedentary as those with no pain and high self-efficacy. These findings suggest that improving self-efficacy for exercise might be an important component of programs to increase physical activity in adults with chronic musculoskeletal pain.

Key Words: epidemiology, aging, health behavior, arthritis

Pain is an obstacle to healthy aging. More than half of older adults report musculoskeletal pain, and most have pain in more than one site (Mobily, Herr, Clark, & Wallace, 1994; Scudds & Robertson, 2000). Research has shown that in older adults with arthritis, exercise can reduce musculoskeletal pain and prevent functional decline (Ettinger et al., 1997). Unfortunately, many older adults do not participate in regular exercise. In fact, about one third of adults age 55–75 years in the United States report that they do not participate in any exercise, and this number climbs with age to 46% of adults age 75 and older (Kamimoto, Easton, Maurice, Husten, & Macera, 1999). Pain is an obvious deterrent to physical activity (Clark, 1999), but little is known about its influence on motivational factors for exercise that

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are associated with readiness to participate in physical activity (Clark; McAuley, Lox, & Duncan, 1993).

According to Bandura’s social-cognitive theory, self-efficacy, control beliefs, and outcome expectancy all exert influence on engagement in behavior (Bandura, 1977). Several studies have shown that exercise self-efficacy, or self-confidence in one’s own ability to exercise, is an important predictor of exercise participation in older adults (Bandura, 1997; Clark, 1999; McAuley et al., 1993). Related factors such as exercise attitudes (outcome expectancy) and control beliefs, or beliefs in one’s own control of exercise behavior, also have been found to predict exercise behavior (Jette et al., 1998; Resnick, 2001). Several authors have suggested pathways relating the various social-cognitive factors that might explain exercise behavior (Bandura, 1997; Clark & Nothwehr, 1999; Conn, 1998; McAuley et al., 1993; Resnick). In planning exercise interventions for older adults, it is important to understand which motivational factors might have the greatest influence on behavior.

Given the complexities of health in older adults, it is critical to understand how chronic pain, an all-too-common problem in that population, can influence social-cognitive factors related to exercise. Such information could guide the inclusion of motivational strategies in the exercise protocols, particularly when the target population consists of very sedentary older adults. The present study examined the relationship between pain and motivational factors for exercise, including self-efficacy, attitudes, and control beliefs. We hypothesized that adults with chronic pain would have lower self-efficacy and less positive attitudes toward exercise than would their counterparts without pain and that weak motivational factors in adults with pain would be associated with more sedentary behavior.

Methods

Study subjects were recruited from senior housing facilities and from the general community in the vicinity of Rockville, MD. After a brief telephone screening, prospective study participants age 75–85 years were sent a health questionnaire by mail to complete and return either by mail or during an in-home visit. Of 328 adults who completed the baseline health questionnaire, 325 answered the pain items and were included in these analyses.

Musculoskeletal pain was assessed in each of four sites—the back, hip, knees, and feet—using two sets of questions about participants’ pain during the preceding month while walking on a flat surface and while lying in bed at night. For each item, respondents were asked to rate the severity of their pain using a numeric rating scale of 0 to 10, with 0 indicating no pain and 10, severe or excruciating pain. The numbers of pain sites rated as moderate or worse pain (≥4) on the scale were summed for an overall back and lower body pain score. Four groups were defined according to number of pain sites: no sites and one, two, and three or four sites.

Self-efficacy for exercise was measured using a three-item scale developed by Lorig et al. (1996). The instrument, which assesses self-confidence in one’s ability to participate in exercise, has been found to be reliable and responsive to change in chronically ill populations (Lorig, et al.). The three-item exercise-attitude
scale measured expectations that exercise would have beneficial effects. The exercise-control-beliefs scale comprised six items addressing beliefs about personal control over participation in exercise. The attitudes and beliefs scales, developed by Jette and colleagues (1998), have been found to have good internal consistency and predict adherence to exercise in older adults.

Physical activity during the preceding week was measured using the Physical Activity Scale for the Elderly, a reliable instrument that has been used in numerous studies of older adults (Washburn, Smith, Jette, & Janney, 1993). Amount of walking was assessed in a question on number of blocks walked per week. Those who walked less than 1 mile per week were classified as sedentary. Participants were asked about demographic characteristics and aspects of health and health status, including self-reported chronic conditions, self-rated health, and the physical-function subscale of the SF-36 (Ware, Sherbourne, Davies, & Stewart, 1988).

Pain groups were described according to demographic and health characteristics using means and percentages. For categorical variables, trend tests measuring trends across number of pain sites were performed using the Mantel-Haenszel chi-square statistic (1 df) and, for continuous variables, t tests of the regression coefficient for number of pain sites entered as an ordinal variable. Logistic-regression models were run to examine the relationship of each of the exercise attitudes and efficacy scales to sedentary behavior, and a final model included all three measures. The combined influence of pain and low self-efficacy was determined using logistic regression, entering dummy terms for each combination of low versus high self-efficacy and each pain group, using high self-efficacy and no moderate or severe lower body pain as the reference category. To test the interaction of low self-efficacy and number of pain sites, we subtracted the deviance of the model containing all the dummy terms of the interaction from that of the model that included dummy terms only for the main effects. The resulting value was a chi-square statistic (3 df) testing the interaction. Another test of interaction, using a product term for low self-efficacy and number of pain sites, yielded similar results.

**Results**

Characteristics of the population according to number of pain sites are shown in Table 1. Moderate to severe back or lower extremity pain was reported by 139 participants (42.8%). There were 39 adults (12%) who had pain in two sites and 31 (9.5%) who had pain in three or four sites. Participants with more reported musculoskeletal pain sites were younger and had lower income and poorer self-reported functioning, according to the SF-36 physical-function scales, than did their peers with fewer or no pain sites. More than 40% of adults with three or four pain sites rated their health as fair or poor, compared with fewer than 10% of those with no pain in the back or lower extremities. Number of pain sites was associated with having felt unusually tired or weak during the preceding month. Most respondents reported having a physician’s diagnosis of arthritis; 57% of respondents without pain reported arthritis, compared with 90% of those with three or four pain sites.

Compared with their peers without pain, adults with one or more pain sites were more likely to report walking less than 1 mile per week (Table 2), and very few
Table 1  Baseline Characteristics of Participants According to Number of Pain Sites (%)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No pain (n = 187)</th>
<th>1 site (n = 68)</th>
<th>2 sites (n = 39)</th>
<th>3 or 4 sites (n = 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 74–79 years</td>
<td>54.5</td>
<td>52.9</td>
<td>56.4</td>
<td>63.3</td>
</tr>
<tr>
<td>Age 80–86 years</td>
<td>45.5</td>
<td>47.1</td>
<td>43.6</td>
<td>36.7</td>
</tr>
<tr>
<td>Female</td>
<td>55.1</td>
<td>63.2</td>
<td>64.0</td>
<td>56.7</td>
</tr>
<tr>
<td>Income &lt;$25,000/year</td>
<td>22.8</td>
<td>20.7</td>
<td>37.5</td>
<td>37.0*</td>
</tr>
<tr>
<td>Education &lt;12 years</td>
<td>15.2</td>
<td>23.5</td>
<td>15.4</td>
<td>26.7</td>
</tr>
<tr>
<td>Married/Living as married</td>
<td>56.2</td>
<td>41.2</td>
<td>43.6</td>
<td>63.3</td>
</tr>
<tr>
<td>Fair/Poor self-rated health</td>
<td>8.6</td>
<td>27.9</td>
<td>20.5</td>
<td>41.9***</td>
</tr>
<tr>
<td>SF-36 physical-function subscale, (M (SD)^a)</td>
<td>(19.1)</td>
<td>(23.9)</td>
<td>(23.7)</td>
<td>(22.4)***</td>
</tr>
<tr>
<td>Unusually weak, preceding month</td>
<td>9.2</td>
<td>23.5</td>
<td>30.8</td>
<td>38.7***</td>
</tr>
<tr>
<td>Unusually tired, preceding month</td>
<td>37.0</td>
<td>54.6</td>
<td>59.0</td>
<td>76.7***</td>
</tr>
<tr>
<td>Chronic conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>heart attack</td>
<td>14.5</td>
<td>16.2</td>
<td>20.5</td>
<td>17.2</td>
</tr>
<tr>
<td>angina</td>
<td>9.7</td>
<td>22.4</td>
<td>12.8</td>
<td>20.0</td>
</tr>
<tr>
<td>intermittent claudication</td>
<td>4.8</td>
<td>17.9</td>
<td>23.1</td>
<td>6.5*</td>
</tr>
<tr>
<td>hip/knee replacement</td>
<td>10.8</td>
<td>16.2</td>
<td>23.1</td>
<td>26.7**</td>
</tr>
<tr>
<td>vertebral fracture</td>
<td>4.9</td>
<td>9.0</td>
<td>10.3</td>
<td>17.2*</td>
</tr>
<tr>
<td>arthritis</td>
<td>57.0</td>
<td>80.9</td>
<td>84.6</td>
<td>90.3***</td>
</tr>
<tr>
<td>lung disease</td>
<td>6.6</td>
<td>10.5</td>
<td>7.7</td>
<td>3.5</td>
</tr>
<tr>
<td>diabetes</td>
<td>10.8</td>
<td>9.0</td>
<td>15.4</td>
<td>20.0</td>
</tr>
<tr>
<td>chronic nervousness</td>
<td>3.2</td>
<td>6.1</td>
<td>15.8</td>
<td>6.9*</td>
</tr>
</tbody>
</table>

Note. Pain categories are based on the sum of number of sites with moderate or worse pain as follows: back, hip, knee, and foot. Moderate or worse pain was pain rated as 4 or more on an 11-point visual analog scale scored from 0 (no pain) to 10 (severe/excruciating pain).

*Medical Outcomes Study Short Form-36 physical-function subscale, scored 0–100, with higher score indicating better function.

*\(p < .05\); **\(p < .01\); ***\(p < .001\).

Adults with pain walked more than 4 miles per week (3.5% of those with pain in three or four sites vs. 17.4% of adults with no pain). There was a modest decrease in overall physical activity level, measured by the Physical Activity Scale for the Elderly, associated with greater number of pain sites (\(p = .23\)).

Adults with more pain sites had lower scores on the exercise-attitudes and exercise-beliefs scales (Table 2). Likewise, exercise self-efficacy was substantially lower in adults with more pain (trend \(p = .0001\)). Low scores in self-efficacy, in the lowest quartile, were found in half of adults with two or more pain sites, compared with 17% of those with no pain. Of the three measures, low self-efficacy was the
only social-cognitive factor that was independently associated with sedentary behavior when all three measures were included in a single logistic-regression model (adjusted odds ratio [OR] = 2.24, 95% CI 1.12–4.47).

In an evaluation of the combined influence of self-efficacy and pain on the likelihood of sedentary behavior (measured as walking less than 1 mile per week), we found that, in general, adults with high self-efficacy for exercise had only a modestly increased likelihood of sedentary behavior in the presence of pain. Adults with low self-efficacy for exercise who had no pain, however, had 2 1/2 times the risk of sedentary behavior that their counterparts with high self-efficacy and no pain did. Adults who had low self-efficacy and reported pain in two or more sites had more than 4 times the likelihood of sedentary behavior that those with no pain and high self-efficacy had (Table 3). There was no statistically significant interaction between number of pain sites and low self-efficacy for exercise.

**Discussion**

Our findings provide evidence that older adults with musculoskeletal pain are more likely to have low self-efficacy for exercise and less positive attitudes and control beliefs about exercise. Of these three, self-efficacy had the greatest association with
Table 3  Likelihood of Sedentary Behavior According to Number of Pain Sites and Self-Efficacy for Exercise

<table>
<thead>
<tr>
<th>Pain category</th>
<th>High Self-Efficacy</th>
<th>Low Self-Efficacy&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>No pain</td>
<td>154</td>
<td>1.0 (reference group)</td>
</tr>
<tr>
<td>1 site</td>
<td>47</td>
<td>1.73 (0.84–3.59)</td>
</tr>
<tr>
<td>2 sites</td>
<td>19</td>
<td>1.95 (0.66–5.75)</td>
</tr>
<tr>
<td>3 or 4 sites</td>
<td>16</td>
<td>2.06 (0.63–6.78)</td>
</tr>
</tbody>
</table>

Note. Sedentary behavior was defined as self-reported walking less than 1 mile per week. OR = odds ratio.

<sup>a</sup>Low self-efficacy was measured as a score of 5, the lowest quartile of the study group.

whether or not an older person was sedentary. When we considered both pain and self-efficacy, we found that pain had only a modest influence on sedentary behavior among those with high self-efficacy. Nonetheless, adults with back or leg pain in one or more sites who also had low self-efficacy were more than 3 times as likely to be sedentary as those with high self-efficacy and no pain were. Given the high prevalence of musculoskeletal pain in the older population, it is important to realize that pain might contribute to low self-efficacy for exercise and thereby interfere with efforts to increase physical activity in senior populations.

To our knowledge, this is the first report to show that exercise self-efficacy is lower in older adults with musculoskeletal pain. Given the lower rates of physical activity that we observed in adults with more sites of moderate to severe pain, the findings are consistent with social-cognitive theory, which posits self-efficacy as a key determinant of behavior (Bandura, 1977). Self-efficacy scores in the group without pain were nearly 50% higher than in those with moderate or severe pain in two or more sites, indicating the very strong impact of pain on older adults’ self-confidence about participating in exercise. In fact, most participants in our study who had low self-efficacy for exercise also had moderate or severe musculoskeletal pain. We know from disability research in older adults with arthritis that pain and mobility self-efficacy both have a strong impact on function (Rejeski, Craven, Ettinger, McFarlane, & Shumaker, 1996). Recent work in this area found that low self-efficacy about mobility, more than knee-pain intensity, predicted declines in mobility over time (Rejeski, Miller, Foy, Messier, & Rapp, 2001). Although self-efficacy is known to be domain specific, it is not surprising that adults with pain have low self-efficacy in other domains related to daily activity.

Few studies have examined the impact of exercise attitudes (outcome expectancy), control beliefs, and exercise self-efficacy in older adults on exercise
behaviors according to prevalence of musculoskeletal pain. Self-efficacy and outcome expectancy have both been found to influence exercise participation and adherence (Clark, 1999; Jette et al., 1998; McAuley et al., 1993). McAuley and colleagues (1993) found that self-efficacy was the only social-cognitive factor to predict adherence 9 months after completion of a 20-week exercise intervention. We could only investigate current participation, rather than initiation or adherence, in physical activity in our cross-sectional analyses, but the findings are consistent with social-cognitive theory in demonstrating the very strong role of exercise self-efficacy in physical activity behavior across pain groups (Bandura, 1977, 1997).

Adults with pain are at risk for functional decline (Leveille et al., 2001) and are an important group to target for exercise-intervention studies. On the one hand, they might be least likely to participate in exercise, yet they might have the most to gain. We do not know whether better control of pain results in greater self-efficacy for exercise, but there is evidence that better self-efficacy for management of pain and coping with pain leads to reduced pain intensity (Bandura, 1997). It is reasonable to hypothesize that participation in physical activity might lessen chronic pain and also increase self-efficacy for exercise. Others have shown that self-efficacy changes overtime during participation in an exercise program (McAuley et al., 1999). In other words, some pain relief might be critical before initiating exercise. Pain reduction that occurs with exercise, however, might be part of a spiral process in which exercise leads to better self-efficacy about exercise, thus, better adherence to exercise protocols, and, subsequently, better control of pain.

Our small sample might not have allowed us to sufficiently assess whether there was a significant interaction between pain and self-efficacy in their relationship with exercise behavior. It was clear that low self-efficacy in adults with pain played an important role in sedentary behavior. The findings cannot be generalized to all older adults, because our study participants were volunteers recruited from senior housing and from the general community in suburban Maryland. Typically, study volunteers are healthier than others in the community, but we did observe a high prevalence of chronic disease. Although pain was common in our study group, the prevalence rates were somewhat lower than has been reported in older populations (Brattberg, Parker, & Thorslund, 1996; Elliott, Smith, Penny, Smith, & Chambers, 1999). The high prevalence of pain in our study group allowed us to examine important questions about pain, attitudes about exercise, and physical activity participation. The findings are consistent with previous reports of the strong relationship between low self-efficacy for exercise and sedentary behavior and provide new information suggesting that low self-efficacy in older adults with musculoskeletal pain might be a key factor in their lack of participation in physical activity.

Awareness of exercise self-efficacy is crucial in developing programs for exercise in older adults. Adults who have musculoskeletal pain are likely to have low self-efficacy and might benefit from counseling not only in pain management but also in empowerment to increase physical activity. Further research is needed to better understand the role of self-efficacy in the pathway from pain to sedentary behavior. For an exercise intervention to be successful in groups with high prevalence of musculoskeletal pain, additional motivational strategies might be needed to enhance self-efficacy for exercise among those with pain.
References


