Differences in Effectiveness of the Active Living Every Day Program for Older Adults With Arthritis

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Objective: The authors explored whether demographic and psychosocial variables predicted differences in physical activity for participants with arthritis in a trial of Active Living Every Day (ALED). Method: Participants (N = 280) from 17 community sites were randomized into ALED or usual care. The authors assessed participant demographic characteristics, self-efficacy, outcome expectations, pain, fatigue, and depressive symptoms at baseline and physical activity frequency at 20-wk follow-up. They conducted linear regression with interaction terms (Baseline Characteristic × Randomization Group). Results: Being female (p ≤ .05), less depressed (p ≤ .05), or younger (p ≤ .10) was associated with more frequent post-test physical activity for ALED participants than for those with usual care. Higher education was associated with more physical activity for both ALED and usual-care groups. Discussion: ALED was particularly effective for female, younger, and less depressed participants. Further research should determine whether modifications could produce better outcomes in other subgroups.

Keywords: behavioral counseling, physical activity, aging

Arthritis, the most common cause of disability in the United States, affects 22.2% (49.9 million) of adults, with close to 80% of those individuals being over the age of 45 years, and these numbers will only increase as the population ages (Centers for Disease Control and Prevention, 2010). Clinical organizations recommend regular physical activity as a proven means to help reduce arthritis-related disability (American College of Rheumatology Subcommittee on Osteoarthritis, 2000; Richmond et al., 2010; Zhang et al., 2010). Regular physical activity and personal physical activity goal achievement can help people with arthritis improve their pain, physical function, health-related quality of life, and comorbid conditions (Kelley, Kelley, Hootman, & Jones, 2011; Knittle et al., 2011; Roddy, Zhang, & Doherty, 2005). In addition, there is evidence of a graded relationship between physical activity and gait speed for people with knee osteoarthritis, indicating the
potential for improved physical function from being more physically active at any level (Dunlop et al., 2011). But prevalence of no leisure-time physical activity is significantly higher for adults with arthritis than for those without arthritis in all states and greater than 30% in almost half \( n = 23 \) of the states (Centers for Disease Control and Prevention, 2011). Barriers to increasing physical activity include arthritis pain and functional limitations, fatigue, depression, low self-efficacy (that is, beliefs about being unable to exercise), and perceived negative outcomes (Britain, Gyrucsk, McElroy, & Hillard, 2011; DeVellis, 1995; Lee et al., 2012; Marks, Allegrante, & Lorig, 2005; Murphy, Sacks, Brady, Hootman & Chapman, 2012; Resnick & Nigg, 2003; Wilcox et al., 2006). Demographic characteristics associated with less physical activity for people with arthritis include being female, minority, older adult, and having less formal education (Dunlop et al., 2011; Fontaine & Haaz, 2006; Kaptein & Badley, 2012; Shih, Hootman, Kruger, & Helmick, 2006).

Because regular physical activity is an integral part of arthritis management, a public health plan to reduce the arthritis burden needs to promote interventions that target these factors related to less physical activity (Fontaine, Heo, & Bathon, 2004). A variety of evidence-based interventions are available to help improve physical activity levels for people with arthritis (Brady, Jernick, Hootman, & Sniezek, 2009; Hootman, Helmick, & Brady, 2012), but very little is known about the extent to which these interventions differ in effectiveness according to risk factors for inactivity (Fontaine et al., 2004). This type of evidence about generalizability of trial findings is seldom reported in the literature (Dzewaltowski, Estabrooks, & Glasgow, 2004). There has been a focus at the national policy level on increasing the use of effective arthritis interventions (Hootman et al., 2012), and this information about differences in effectiveness could be applied to more effectively disseminate currently available interventions to groups who experience better outcomes. In addition, this information is a first step toward modifying these interventions for groups who tend to not fare as well.

We thus conducted a secondary analysis to explore whether the aforementioned demographic and psychosocial variables that have been associated with physical activity for people with arthritis in prior studies predicted physical activity frequency for participants with arthritis enrolled in a trial of Active Living Every Day (ALED); previous analyses had shown a relationship between ALED and increase in physical activity frequency and some physical-function measures on average (Callahan et al., in press). ALED is a 20-week course to help individuals obtain skills important for initiating or increasing physical activity and is informed by the following behavior-change theories: social cognitive theory, which posits that behavior change is predicted by one’s beliefs that one can adopt a certain behavior (self-efficacy) and that the behavior will have the desired outcome (outcome expectations; Bandura, 1997); the transtheoretical model, which posits that people have different levels of readiness for change and that interventions can be individually tailored to match one’s stage of change (Prochaska, Norcross, & DiClemente, 1994); decisional-balance theory, which explains how people evaluate pros and cons such as benefits and costs to self and others in considering a behavior change (Janis & Mann, 1977); and the relapse-prevention model that helps individuals identify high-risk situations for relapse, develop plans for preventing relapse, and think differently about relapses, for example, as a learning experience rather than a failure (Marlatt & Gordon, 1985). Self-efficacy (in this case beliefs about one’s ability to manage both arthritis symptoms and exercise) and outcome expectations are
particularly important factors to examine in this context because they can potentially be modified with specific strategies including skills mastery and personalized goal setting (Bandura, 2004). These factors are thus commonly targeted in individually tailored physical activity behavior-change interventions, including those for people with arthritis, under the premise that individuals will more likely pursue behavior they regard as potentially attainable and beneficial (Hughes, Seymour, Campbell, Desai, & Huber, 2010; Marks et al., 2005). We were also interested in exploring whether demographic characteristics predicted physical activity, because, although not modifiable, these characteristics can shed light on how to tailor the program to more effectively affect specific subgroups of people managing arthritis.

Method

Participants and Procedure

Our study sample consisted of participants with arthritis enrolled in the ALED trial (N = 339) and randomized to receive either ALED plus usual care or only usual care (defined as the care participants received from any health provider or other program). Community-dwelling adults were recruited to participate in the ALED evaluation using advertisements in locations throughout communities, including newspapers, church bulletins, community centers, and the Arthritis Foundation. The study was conducted in 17 sites throughout North Carolina. Eligibility criteria were being at least 18 years old, reporting any type of doctor-diagnosed arthritis or joint pain/stiffness and some limitation due to their arthritis or joint pain, not being too active (engaging in less than 30 min, three times a week of moderate-intensity exercise or not getting heart rate up from daily activity), and planning to stay in their community for at least 1 year. Individuals were excluded if their mental status did not allow them to complete the study questionnaires, they were unable to transfer unassisted from a wheelchair, they were unable to speak and read English, or they did not have a physician release form to participate in physical activity.

Intervention participants attended weekly hour-long group meetings for 20 weeks at senior centers, community health centers, or hospital wellness centers to discuss topics such as identifying and overcoming barriers to activity, realistic goal setting, and preventing relapse. Participants received individual reading and work assignments between sessions using the ALED book and handouts, with group discussions reinforcing the material in the ALED book (Blair, Dunn, Marcus, Carpenter, & Jaret, 2001). Program instructors facilitated the group discussions. Instructors (N = 17) were recruited through the North Carolina Agencies on Aging and trained at one time according to standardized ALED protocol. They each had some experience with community-based health work but not necessarily with people who have arthritis; this recruitment criterion was designed to represent people working with state health agencies in community-based settings. To provide a background on arthritis, instructors were supplied with free pamphlets from the Arthritis Foundation and the National Institute of Arthritis, Musculoskeletal, and Skin Diseases on a wide range of arthritis-related topics for distribution to participants; these pamphlets were also mailed to control-group participants. An average of 10 participants participated in the course at each site. More than half of participants (56%) attended 15–20 classes, 23% attended 10–14 classes, and 21% attended 1–9 classes.
Research staff administered the baseline self-report questionnaire at initial information sessions conducted at various sites between January and March 2004 before the first program class. Posttest data collection was conducted on 1 day at each site after the final ALED session, between June and August 2004. The study team contacted participants who could not attend on the designated day and provided them with the posttest questionnaire first by mail and then by phone. The study was approved by the University of North Carolina, Chapel Hill, institutional review board, and all participants provided their informed consent.

Measures

**Physical Activity.** Physical activity was assessed by self-report physical activity frequency, measured with the 41-item CHAMPS (Community Healthy Activities Model Program for Seniors) physical activity questionnaire for older adults (Harada, Chiu, King, & Stewart, 2001; Stewart et al., 2001). Frequency was assessed by asking about weekly frequency of participation (“In a typical week during the past 4 weeks, did you . . . ?” If yes, “how many times a week?”). The frequency measures were continuous and calculated by summing the frequency per week for all categories.

**Predictors.** Predictors were health-related psychosocial characteristics (self-efficacy for exercise, arthritis self-efficacy, outcome expectations for exercise, perceived pain and fatigue severity, depressive symptoms) and demographic characteristics (education, gender, age, race).

Self-efficacy for exercise assessed the extent of a person’s confidence to exercise in the face of barriers with a 9-item scale (Resnick & Jenkins, 2000). Responses ranged from 1 (**not confident**) to 10 (**very confident**), and the total score was the average of these responses (total score range: 1–10). The introduction question used in this study (“How confident are you that you can be physically active if . . . ?”) was modified from the original (“How confident are you right now that you could exercise three times per week for 20 minutes if . . . ?”). Although the introduction to the items was changed to ask about barriers to performing any physical activity rather than barriers to meeting a specified amount of activity, the reliability of the modified version (alpha coefficient of .92) was the same as for the original.

The Arthritis Self-Efficacy scale measured one’s perceived confidence about managing one’s arthritis pain and other symptoms with 11 items (Lorig, Chastain, Ung, Shoor, & Holman, 1989). Responses ranged from 1 (**very uncertain**) to 10 (**very certain**), and the total score was the average of these responses (total score range: 1–10).

Outcome expectations were measured with the Outcome Expectations for Exercise scale, a 9-item scale that asked about exercise expectations specific to older adults (Resnick & Jenkins, 2000). Respondents were asked to state the extent to which they agreed or disagreed with statements related to their personal expectations, such as exercise “makes me feel better physically” or “makes my mood better in general.” Responses ranged from 1 (**strongly disagree**) to 5 (**strongly agree**), and the total score was the average of these responses (total score range: 1–5).

Magnitude of arthritis symptoms, pain, and fatigue was assessed with the Visual Analog Scale, in which participants marked an X on a 100-mm line to describe the amount of pain they had experienced in the past week, with **no pain** on one end of the line and **pain as bad as can be** on the other end (Lorig, 1996).
Depressive symptoms were measured with the 20-item Center for Epidemiologic Studies Depression (CES-D) scale. The score was used in this study as a continuous measure, the sum of the 20 item weights and ranging from 0 to 60. Higher scores indicate higher level of depressive symptoms; a score of 16 or more has been considered as indicating risk for depression (Radloff, 1977).

**Additional Measures.** Covariates were number of comorbidities, location of program, and baseline values of the outcome measures. Participants selected their comorbid conditions from 11 nonmusculoskeletal conditions used in the American Academy of Orthopedic Surgeons Musculoskeletal Outcomes Data Evaluation and Management System (Tashjian, Henn, Kang, & Green, 2004). Dummy variables for each site were created to control for differences by program location. The Health Assessment Questionnaire provided a valid and reliable self-reported measure of disability related to 20 activities of daily living within eight domains (dressing, arising, eating, walking, hygiene, activities, reach, and grip; Fries, Spitz, Kraines and Holman, 1980). Responses for each activity ranged from 0 (no disability) to 3 (complete disability). The total Health Assessment Questionnaire score was the mean of the 8 domain scores ranging from 0 to 3, with higher values indicating poorer physical functioning.

**Data Analysis**

We conducted linear multiple regression with interaction terms (Baseline Characteristic × Randomization Group) to examine whether baseline psychosocial and demographic characteristics predicted a difference in the effect of the intervention on posttest physical activity. A significant interaction would mean that there was a differential effect of randomization group on physical activity based on that characteristic. We completed an intention-to-treat analysis, maintaining the original randomized group assignment. We used a model-building approach with backward stepwise regression to eliminate redundancy among predictors, which exhibited high intercorrelations (Meyers & Gamst, 2005). Because the theoretical constructs (self-efficacy and outcome expectations) and arthritis symptoms (pain and fatigue) each formed distinct sets of conceptually related and statistically intercorrelated variables ($p < .0001$), we analyzed these variables as blocks to determine their combined effect. We started with a full model of candidate variables and then trimmed at each step, removing the variable or block with the highest $p$ value $>.10$ and retesting until we arrived at the most parsimonious model. We stopped when we arrived at a final model with all interactions or main effects with $p \leq .10$.

We handled missing data by first deleting cases with missing outcome responses and then filling in missing predictor variables of the remaining cases with multiple imputations, using SAS version 9.1 (SAS Institute, Inc., Cary, NC) and the Markov chain Monte Carlo method. Participants who did not complete the questionnaire for the posttest outcome ($n = 59$) were deleted from analysis under the rationale that additional benefits would not be gained by imputing the outcome variables (Allison, 2001). Analyses were conducted on all of the predictor and outcome variables to determine if there was a difference at baseline between those who completed the posttest questionnaire and those who did not, and no significant differences at $p \leq .05$ were found. The number of missing cases for each predictor variable ranged from 3 to 18.
Results

The final sample included a total of 280 participants. Baseline characteristics are shown in Table 1. The mean age was 69 years. The majority of participants were female and White. Slightly more than half of the sample had greater than a high school education. The average time that these participants had had arthritis was 12 years. More than one third reported at least one comorbid condition, with close to half having two or more.

Table 1 Baseline Characteristics of Participants in a Trial of Active Living Every Day (ALED) for Adults With Arthritis

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total sample (N = 280)</th>
<th>ALED intervention (n = 139)</th>
<th>Usual care (n = 141)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, M (SD)</td>
<td>69.1 (10.3)</td>
<td>68.0 (10.6)</td>
<td>70.1 (9.9)</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>222 (82.8)</td>
<td>114 (85.7)</td>
<td>108 (80.0)</td>
</tr>
<tr>
<td>Race, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>217 (78.0)</td>
<td>102 (73.9)</td>
<td>115 (82.1)</td>
</tr>
<tr>
<td>Black</td>
<td>51 (18.2)</td>
<td>28 (20.1)</td>
<td>23 (16.3)</td>
</tr>
<tr>
<td>American Indian/Alaskan native</td>
<td>8 (2.9)</td>
<td>7 (5.0)</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td>Education &gt; high school, n (%)</td>
<td>163 (60.4)</td>
<td>74 (54.8)</td>
<td>89 (65.9)</td>
</tr>
<tr>
<td>Years with arthritis, M (SD)</td>
<td>12.3 (11.8)</td>
<td>11.3 (10.7)</td>
<td>13.4 (12.7)</td>
</tr>
<tr>
<td>Number of comorbidities, M (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>50.0 (17.9)</td>
<td>27.0 (194.0)</td>
<td>23.0 (16.3)</td>
</tr>
<tr>
<td>1</td>
<td>101.0 (36.0)</td>
<td>48.0 (34.5)</td>
<td>53.0 (37.6)</td>
</tr>
<tr>
<td>2</td>
<td>74.0 (26.4)</td>
<td>35.0 (25.2)</td>
<td>39.0 (27.7)</td>
</tr>
<tr>
<td>3+</td>
<td>55.0 (19.7)</td>
<td>29.0 (20.9)</td>
<td>26.0 (18.4)</td>
</tr>
<tr>
<td>Self-reported function (HAQ), M (SD)(^a)</td>
<td>0.94 (0.64)</td>
<td>0.92 (0.64)</td>
<td>0.96 (0.64)</td>
</tr>
<tr>
<td>Exercise self-efficacy, M (SD)(^b)</td>
<td>6.4 (2.1)</td>
<td>6.6 (2.1)</td>
<td>6.2 (2.0)</td>
</tr>
<tr>
<td>Arthritis self-efficacy, M (SD)(^c)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>symptom arthritis self-efficacy</td>
<td>7.0 (2.1)</td>
<td>7.3 (2.2)</td>
<td>6.9 (2.0)</td>
</tr>
<tr>
<td>pain arthritis self-efficacy</td>
<td>6.6 (2.0)</td>
<td>6.9 (2.2)</td>
<td>6.6 (1.9)</td>
</tr>
<tr>
<td>Outcome expectations for exercise, M (SD)(^d)</td>
<td>4.0 (0.7)</td>
<td>4.0 (0.7)</td>
<td>4.0 (0.7)</td>
</tr>
<tr>
<td>Arthritis symptoms (VAS), M (SD)(^e)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pain</td>
<td>41.9 (26.4)</td>
<td>43.7 (27.9)</td>
<td>40.1 (24.9)</td>
</tr>
<tr>
<td>fatigue</td>
<td>39.5 (30.0)</td>
<td>41.2 (30.9)</td>
<td>37.9 (29.2)</td>
</tr>
<tr>
<td>CES-D, M (SD)</td>
<td>13.8 (9.0)</td>
<td>15.1 (10.2)</td>
<td>12.6 (7.6)</td>
</tr>
</tbody>
</table>

Note. HAQ = Health Assessment Questionnaire; VAS = visual analog scale; CES-D = Center for Epidemiologic Studies Depression scale.

\(^a\)Possible total score from 0 (no disability) to 3 (complete disability). \(^b\)Possible total score from 1 (not confident) to 10 (very confident). \(^c\)Possible total score from 1 (very uncertain) to 10 (very certain). \(^d\)Possible total score from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating better outcome expectations. \(^e\)Measured with a 100-mm line with anchors being 0 = no pain and 100 = pain as bad as it could be.
Results of the regression analysis are displayed in Table 2. We found that the relationship between ALED participation and physical activity frequency varied by gender \((p \leq .05)\), baseline depressive symptoms \((\text{CES-D}; p \leq .05)\), and age \((p \leq .10)\). These interactions are displayed in Figures 1–3. Women in the intervention group had a higher rate of posttest physical activity than those in the usual-care group, and female intervention participants reported the highest level of posttest physical activity frequency overall (unadjusted observed mean physical activity frequency

<table>
<thead>
<tr>
<th>Variable</th>
<th>(b)</th>
<th>(SE)</th>
<th>95% CL</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomization group</td>
<td>1.59</td>
<td>0.93</td>
<td>–0.23, 3.41</td>
<td>.09</td>
</tr>
<tr>
<td>Education</td>
<td>3.61</td>
<td>1.46</td>
<td>0.74, 6.47</td>
<td>.01</td>
</tr>
<tr>
<td>Gender</td>
<td>–0.23</td>
<td>0.94</td>
<td>–2.08, 1.61</td>
<td>.80</td>
</tr>
<tr>
<td>CES-D</td>
<td>–0.05</td>
<td>0.09</td>
<td>–0.22, 0.13</td>
<td>.61</td>
</tr>
<tr>
<td>Age</td>
<td>0.03</td>
<td>0.08</td>
<td>–0.13, 0.18</td>
<td>.75</td>
</tr>
<tr>
<td>Gender × Group</td>
<td>2.09</td>
<td>0.95</td>
<td>0.22, 3.96</td>
<td>.03</td>
</tr>
<tr>
<td>CES-D × Group</td>
<td>–0.24</td>
<td>0.09</td>
<td>–0.41, –0.07</td>
<td>.00</td>
</tr>
<tr>
<td>Age × Group</td>
<td>–0.13</td>
<td>0.07</td>
<td>–0.27, 0.01</td>
<td>.06</td>
</tr>
</tbody>
</table>

**Note.** CES-D = Center for Epidemiologic Studies Depression scale. Gender was coded as 0, male; 1, female. Education was coded as 0, ≤high school education; 1, >high school education. Model controlled for baseline physical activity, program location, and number of comorbidities.

**Figure 1** — Interaction between gender and randomization group on posttest physical activity frequency from a trial of Active Living Every Day for adults with arthritis. Controlled for baseline physical activity, program location, and number of comorbidities. CHAMPS = Community Health Activities Model Program for Seniors questionnaire.
In contrast, men in the intervention group did not report more physical activity at posttest than men in the usual-care group. In addition, lower CES-D scores and younger age were associated with more physical activity for ALED participants compared with usual care, while higher CES-D and older age were associated with more physical activity for the usual-care group.

**Figure 2** — Interaction between CES-D and randomization group on posttest physical activity frequency from a trial of Active Living Every Day for adults with arthritis. Controlled for baseline physical activity, program location, and number of comorbidities. High and low baseline CES-D scores were estimated for illustration. CHAMPS = Community Health Activities Model Program for Seniors questionnaire; CES-D = Center for Epidemiologic Studies Depression scale.

**Figure 3** — Interaction between age and randomization group on posttest physical activity frequency from a trial of Active Living Every Day for adults with arthritis. Controlled for baseline physical activity, program location, and number of comorbidities. Older and younger ages were estimated for illustration. CHAMPS = Community Health Activities Model Program for Seniors questionnaire.

[times/week] = 22.79 female intervention vs. 14.97 female usual care, 20.89 male intervention, and, 21.1 male usual care). In contrast, men in the intervention group did not report more physical activity at posttest than men in the usual-care group. In addition, lower CES-D scores and younger age were associated with more physical activity for ALED participants compared with usual care, while higher CES-D and older age were associated with more physical activity for the usual-care group. We
also found that education level predicted self-reported posttest physical activity frequency, regardless of whether a participant was in the intervention group.

**Discussion**

The results of this analysis give us information that can help predict who may benefit most from participating in ALED when it is delivered to people with arthritis and how the program might be adapted to better meet needs of the other groups. Four demographic (education, gender, age and race) and three health-related psychosocial predictors (arthritis symptoms, depressive symptoms, and social-cognitive constructs of self-efficacy and outcome expectations) were tested. We found that being female, having fewer depressive symptoms, and being younger were associated with better posttest physical activity outcomes for individuals in the intervention group than for those receiving their usual care. Having more than a high school education predicted better physical activity outcomes regardless of randomization group.

That this program was particularly successful for women with arthritis is important, indicating a potential widespread public health benefit from targeting the program to women or delivering it in settings frequented by women. Arthritis affects more women than men in every age group, and this disparity increases with age (Centers for Disease Control and Prevention, 2010). In addition to having more arthritis, women experience greater burden from arthritis than men do, with more women hospitalized because of it and experiencing more disability, physical limitations, and symptoms (Theis, Helmick, & Hootman, 2007). In addition, among people with arthritis, women have a higher risk than men of being inactive (Dunlop et al., 2011; Fontaine & Haaz, 2006; Kaptein & Badley, 2012). By having such a pronounced effect on women, this program has the likelihood of increasing physical activity levels of a group most at risk for both inactivity and poor arthritis outcomes.

There are a number of potential explanations for a greater difference in physical activity between the ALED and usual-care groups among women compared with men. One reason that women responded better than men could have been the group-based aspect. Older women are more likely than older men to prefer group-based physical activity (King, 2001). This benefit of being in a group is reflected in a qualitative evaluation of ALED, in which participants said that they liked the opportunity to share information about living with their arthritis, such as dealing with pain and other symptoms (Callahan et al., 2007). Indeed, Brittain et al. (2011) found in a survey of women with arthritis that moderate physical activity frequency was more strongly associated with perceived limitations than presence of symptoms, indicating a need for programs like ALED in which participants can help each other identify and implement arthritis coping strategies. Men, on the other hand, have more often described physical activity as having fitness and health rather than social benefits (Sherwood & Jeffery, 2000). Men also could have had more difficulty dealing with physical limitations in the context of increasing their physical activity levels. Data from the National Health Interview Survey have revealed that men with arthritis are more likely than women to limit their physical activity due to severe joint pain (Shih et al., 2006). Thus, possible modifications for future dissemination to older men with arthritis might include more emphasis on dealing with the barrier of pain. Male participants may also respond better to
independent study than to group-based discussion of the ALED book. We were not able to assess reasons for gender differences with our data, and it would be important to assess this with future samples that include more male respondents.

It is also important to consider the way in which depressive symptoms affect how people with arthritis fare in physical activity interventions. There are a number of factors that could explain the diminished effects of the intervention among those with more depressive symptoms, including greater pain and fatigue, difficulty coping with arthritis symptoms, more comorbid health problems, and general difficulty with participating in physical activity (Brawley, Rejeski, & King, 2003; DeVellis, 1995; Dickens, McGowan, Clark-Carter, & Creed, 2002; Murphy et al., 2012; Rosemann et al., 2007; Wolfe & Michaud, 2009). It is notable that baseline arthritis pain and fatigue did not significantly predict posttest physical activity in this analysis. In addition, in a qualitative evaluation of ALED, there were no meaningful differences in comments about pain as a barrier between participants with moderate versus higher amounts of arthritis pain (VAS >40; Callahan et al., 2007). These results indicate that it might not be arthritis symptoms in and of themselves, but rather depression as it relates to arthritis symptoms, that best predicts posttest physical activity. Hawker et al. (2011) have explored how symptoms and depression relate in people with arthritis; their results indicate that greater arthritis pain may predict more depressive symptoms through increases in disability and fatigue. It is possible that inexperience with arthritis might have affected the ability of some instructors to help participants address these arthritis-related barriers; modifications to help individuals with depressive symptoms participate in and benefit more from the program might include incorporating cognitive techniques for coping with symptoms, for example, replacing maladaptive thoughts with those that are helpful for enhancing pain control (Keefe, Somers, & Martire, 2008).

The lesser effects of this intervention for older participants may have been due to limitations associated with older age or with the focus of the intervention. It is well known that physical activity frequency declines with increased age, related in part to physical or psychological limitations commonly seen in the older old (Sallis, 2000). Furthermore, this relationship between aging and physical activity decline is more common in women (Shaw, Liang, Krause, Gallant, & McGeever, 2010), in particular women with arthritis (Kaptein & Badley, 2012). Thus, because the majority of our sample consisted of women, it is plausible that physical or psychological limitations could explain this relationship between age and physical activity. It is also possible that the strategies and focus of this intervention did not mesh as well with the inclinations of older participants. It may be that the older participants in this sample would have benefited more from an approach more directly relevant to their arthritis or other health needs rather than a general lifestyle intervention. Cohen-Mansfield, Marx, Biddison, and Guralnik (2004) found that adults 74 years of age and older preferred having a health professional monitor their participation in exercise and that this was especially true for those who had poorer self-reported health or were in more pain. Furthermore, older participants in their sample reported wanting to exercise, either at home or in a class, less often than did the younger participants.

We found a relationship between more formal education and higher physical activity at follow-up and no differences in intervention effectiveness across education levels. The relationship between more formal education and higher physically
activity frequency at follow-up is consistent with previous literature on physical activity in adults in general and those with arthritis (Centers for Disease Control and Prevention, 2007; Fontaine & Haaz, 2006; Shih et al., 2006). As in this study, no differences across education levels were found in the original randomized trial, Project Active, although participants in that sample were highly educated (Dunn et al., 1999), while close to half of participants in this trial had less than a high school education. Intervention participants with more than a high school education in the dissemination study of ALED were also more likely to increase their physical activity and meet physical activity recommendations at posttest than those with less education (Wilcox et al., 2009).

There are some limitations to this study. The physical activity measure was based on self-report, and, although self-reported behavior has been shown to be a valid indicator of health behavior, there is the possibility of recall or social desirability bias potentially inflating physical activity scores (Lucas & Baird, 2005; Prince et al., 2008). The CHAMPS questionnaire, designed specifically to facilitate recall by older adults with preformatted categories of activities and duration, has been established as a valid measure of physical activity with older adults (Harada et al., 2001; Stewart et al., 2001). Another limitation is that we modified the Self-Efficacy for Exercise scale question to ask about general exercise rather than a specific amount, and, although we found the interitem reliability to be the same as with the original scale, other psychometric properties would need to be more fully evaluated.

This community-based sample was mostly White, which may have limited our ability to detect an effect of race on intervention outcomes. The effect of race on intervention outcomes is an important area for future research. There are known disparities in arthritis outcomes by race, with Blacks in particular reporting more chronic-pain- and arthritis-attributable activity limitations than Whites (Allen et al., 2009; Centers for Disease Control and Prevention, 2010; McBurney & Vina, 2012). There is also evidence that these disparities can be mitigated with behavior-change interventions (Allen, 2010; Allen et al., 2010).

Although higher self-efficacy and outcome expectations are commonly associated with more physical activity, these characteristics did not emerge as significant predictors in our analysis. This inconsistency could be due to our decision to control for baseline physical activity in this prospective study design. It is possible that a positive feedback loop existed in which one’s prior beliefs about one’s ability to conduct or benefit from physical activity could have shaped physical activity at baseline and later time points, including posttest. Thus, by controlling for baseline physical activity, we could have, in essence, disregarded it as part of the causal chain between beliefs and posttest physical activity, leading us to underestimate the total effect of control beliefs. This question can be assessed with experimental analyses specifically designed to test causal relationships (Weinstein, 2007).

In sum, our findings shed light on how ALED and similar community-based lifestyle interventions can be better targeted to individuals with arthritis. We found that certain participant characteristics were associated with higher posttest physical activity frequency for ALED participants than individuals receiving usual care. We have more evidence from this study that, when disseminated to people with arthritis as an off-the-shelf, standardized non-arthritis-specific program, ALED might be especially beneficial for women and less helpful for the older old and those with
more depressive symptoms. This is not to say that individuals who were in the intervention but did not fare as well should not receive this program but, rather, that future research can explore reasons for these associations and whether targeted modifications might result in better outcomes.

References


