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## The Effectiveness of an Online Mind-Body Intervention for Older Adults With Chronic Pain

Rebecca L. H. Berman,\* Madelyn A. Iris,\* Rita Bode,<sup>†</sup> and Carol Drengenberg<sup>‡</sup>

\*Leonard Schanfield Research Institute, CJE SeniorLife, Chicago, Illinois.

<sup>†</sup>Rehabilitation Institute of Chicago, Chicago, Illinois.

<sup>‡</sup>Midwest Palliative and Hospice CareCenter, Glenview, Illinois.

**Abstract:** The Self-care Pain Management Project assessed the feasibility and efficacy of delivering online mind-body self-care techniques to 78 adults aged 55 and older with chronic pain. To assess feasibility, the study monitored use of the intervention and documented participant satisfaction. A randomized trial with intervention (n = 41) and waiting list comparison groups (n = 37) was used to assess changes in pain intensity, limitations due to pain, pain self-efficacy, depression, anxiety, and awareness of responses to pain from baseline to follow-up at 6 weeks. There were statistically significant results for between-group difference in awareness of responses to pain, improvements in pain intensity and pain interference for both groups, and increases in confidence with using non-medical self-care techniques to manage pain for the intervention group. Reductions in mean pain scores reported by the intervention group at log on and log off also suggest that the intervention may have an immediate impact on reducing pain. Findings document the feasibility of a relatively short-term, online mind-body pain management intervention that can have benefits for participants. The characteristics of those who volunteered for an online self-care pain management intervention also have implications for identifying target populations for such interventions.

**Perspective:** This article documents the outcomes of an Internet-based self-care pain management intervention that focused on mind-body exercises. The study suggests that the Internet can be an efficient mode for delivering self-care education to older adults with chronic pain and has potential benefits that complement clinical care.

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**Key words:** Complementary and alternative medicine, self-care, pain management, Internet.

Chronic pain can limit a sufferer's activities, is associated with social isolation and depression, presents challenges to sense of self, and can dramatically affect quality of life.<sup>9,26,50</sup> Older people with chronic pain are likely to experience more physical impairments and interference with activities than younger people,<sup>59,67</sup> and patterns of pain location tend to broaden with age.<sup>59</sup> Widespread pain may especially affect the progression of disability and impaired mobility.<sup>29</sup>

The subjective experience of chronic pain, in particular negative thinking and stress, can play an impor-

tant role in the management of pain, communication of pain to others, and treatment outcomes<sup>52,60</sup> and can exacerbate pain or the disease process leading to pain.<sup>3</sup> Self-care strategies for managing stress, facilitating positive coping behaviors, or reducing anxiety may be especially effective for mediating psychological and social components of pain management. For instance, behavioral-cognitive therapies often focus on maladaptive coping responses, perceived helplessness, and low self-efficacy for pain management.<sup>9</sup> These therapies, including mind-body approaches, have demonstrated benefits for a wide variety of pain conditions, particularly interventions with multiple components or approaches.<sup>3,5</sup> They have been associated with reductions in pain frequency, pain intensity, pain duration, depression, anxiety, and medication use, as well as improvements in self-efficacy, ability to control pain, coping, activity levels, and health-related quality of life.<sup>5,9,12,15,53,54,60</sup>

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Address reprint requests to Dr. Rebecca L.H. Berman, Leonard Schanfield Research Institute, CJE SeniorLife, 3003 W. Touhy Avenue, Chicago, IL 60645. E-mail: [rebeccaberman@cje.net](mailto:rebeccaberman@cje.net)

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There is growing evidence that older adults will use and benefit from complementary and alternative medicine (CAM) and mind-body therapies.<sup>4,12,13,17,43,53,61,64</sup> Future cohorts of baby boomers may be more inclined to use such therapies because more older adults are likely to turn to the Internet for health information.<sup>19,20,37,48</sup> Delivering self-care education via the Internet may be of particular benefit for people in chronic pain who are isolated or have difficulty leaving the home. Online access to self-care education overcomes previously identified barriers to participation among older people such as lack of transportation, inability to travel, time conflicts, and reluctance to participate in a group or associate with other frail individuals.<sup>4,60</sup>

The benefits of online self-care interventions for a variety of health conditions appear to be comparable to in-person interventions.<sup>8</sup> For instance, an Internet-based chronic disease self management program demonstrated improvements in self-efficacy and health status,<sup>31</sup> and a web-based stress management intervention showed reduced stress and improvements in ability to manage stress.<sup>22</sup> Online self-care interventions addressing pain due to a variety of conditions have also been associated with decreased pain and increased control over pain<sup>8,30</sup>; reduced catastrophizing of pain and maladaptive coping<sup>1,8</sup>; reduced disability and improved role function<sup>1,30</sup>; reduced depression and perceived stress<sup>1</sup>; decreased physician visits and time spent in hospitals<sup>30</sup>; and increased work hours.<sup>6</sup>

To explore such potential benefits the Self-care Pain Management Project, conducted by CJE SeniorLife, tested an online intervention providing mind-body exercises for adults aged 55 years and older who have chronic pain. The age of the sample was defined by the target population of CJE SeniorLife. The primary aims of the study were to assess the feasibility of delivering self-care tools to older adults via the Internet and to document changes in pain and ability to manage chronic pain. We predicted that participants in the intervention group but not the comparison group would demonstrate improvements in (1) pain intensity, (2) limitations due to pain, (3) pain self-efficacy, (4) depression, and (5) anxiety. We also expected participants in the intervention group would experience increased awareness of their responses to pain, improved confidence in their ability to manage pain, and increased use of self-care techniques.

## Methods

The Leonard Schanfield Research Institute (LSRI) at CJE SeniorLife conducted the Self-care Pain Management study from 2006 to 2007. The content of the intervention was developed by Midwest Hospice and Palliative Care-Center in Glenview, Illinois, and adapted for the web site by the LSRI. The study documented feasibility and used a randomized trial design with intervention and waiting list comparison groups, using a convenience sample of 78 community-dwelling older adults. Outcomes for all participants were assessed at baseline (pre-test) and follow-up (post-test) after a 6-week intervention period.

The study was approved by the Mount Sinai Hospital Institutional Review Board in Chicago, Illinois, CJE SeniorLife's Institutional Review Board of record, and all participants provided written informed consent.

## Participants and Setting

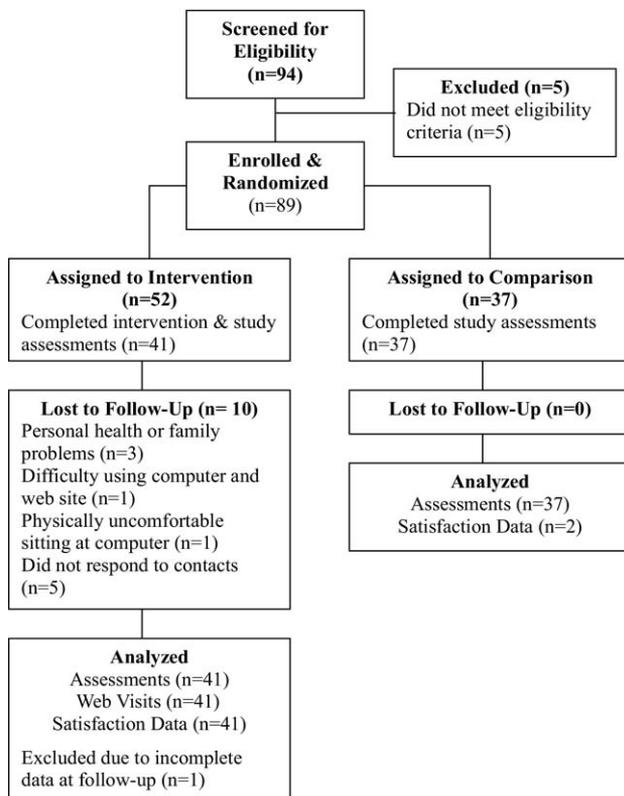
Participants were recruited from Chicago area community-based settings including CJE SeniorLife's home and community-based programs, other service providers, community centers, senior centers, and religious congregations as well as from CJE SeniorLife's Research Registry, a database of individuals who have indicated an interest in participating in research projects. Information about the study was disseminated to recruitment sites through newsletter announcements, flyers, presentations, and more broadly through public service announcements and media releases.

Individuals initiated contact with LSRI directly to express interest in participation and were enrolled in the study on a rolling basis over a period of 7 months. Individuals were included in the study if they (1) were aged 55 years or older, (2) reported at least 1 day in the previous 30 days when pain made it difficult to do usual activities and/or at least moderate levels of pain on average (a minimum score of 3 on a scale of 0 to 10), (3) had basic familiarity with computers, and (4) could read and understand English. Five people expressed interest in the study but did not meet study eligibility criteria and 1 individual did not respond to subsequent contacts.

Of the 89 participants who enrolled in the study, 11 participants from the intervention group (12.4%) did not complete the post-assessment interview or were excluded from analysis; all comparison group participants completed the study and were included in analysis (Fig 1). Of the 11 intervention group participants who did not complete the study, 3 discontinued their participation in the study due to personal health and/or family problems, 1 discontinued participation due to difficulties with using a computer and the web site, and 1 was physically uncomfortable sitting at a computer. An additional 5 individuals were excluded from analysis because they did not respond to contacts for the follow-up interview. Finally, 1 participant was excluded from the analysis due to incomplete follow-up data. Of the final sample of 78, 41 were in the intervention group and 37 were in the comparison group.

## Procedures

Potential participants contacted a Research Assistant (RA) by phone, who then administered a screening tool. If participants qualified for the study, the RA arranged a meeting at the individual's home or another location of their preference, read aloud the informed consent materials and secured consent. The RA then conducted the initial interview, which included a demographic survey, a survey to assess current pain management practices and Internet experiences, and baseline assessment of outcomes. Participants were randomly assigned to either the intervention or comparison group via a simple coin



**Figure 1.** Flow of participants through the randomized trial.

toss, after the baseline interview was completed. Group assignment was not concealed to the RAs. Those assigned to the intervention group received a brief orientation to the project web site from the RA; those in the comparison group received no materials. Two RAs, one of whom also served as the study nurse, conducted follow-up assessments with all participants over the phone at 6 weeks (ie, completion of the intervention for those in the intervention group). All participants received \$100 for their participation in the study project after completing the follow-up interview, and comparison group participants were given access to the intervention after the follow-up interview.

### Intervention Protocol

Intervention group participants were instructed to use the online intervention at least once a week for 6 weeks. Only research participants had access to a web site that was developed specifically for the purpose of the intervention. Participants were provided with a user name and password. They were able to access the web site on their own schedule and use the intervention at their own pace, at a location of their choice. The RA asked participants to first visit an introductory module describing a problem-solving approach to planning for change, based on the 6-stage model outlined by Prochaska et al.<sup>49</sup> They were also asked to try each of 6 modules at least once, in any order. Since type or source of pain may be associated with differential effectiveness of various types of mind-body therapies<sup>3</sup> and the study included participants with

a range of pain-related conditions and locations, the intervention intentionally provided a variety of mind-body exercises. The modules were purposefully designed to be generic for a variety of chronic pain conditions, and we expected that participants would find some exercises more helpful than others.

The self-care modules included a selection of several exercises in each of the following areas: (1) Abdominal breathing, (2) relaxation, (3) writing about positive experiences, (4) writing about difficult experiences, (5) creative visual expression, and (6) positive thinking. To accommodate alternative modes of learning, online materials included audio, visual, and textual components, as well as illustrative examples and worksheets that encouraged participants to reflect on their responses to pain and develop a plan of action. The intervention also included an overview of CAM, suggestions for how to communicate about pain to others, and general information about chronic pain. The modules were written at an average Flesch-Kincaid grade level of 8.5, with individual passages ranging from seventh to twelfth grade (based on readability statistics via Microsoft Word; Microsoft Corp., Redmond, WA).

During the 6-week intervention period, an RA monitored participants' use of the site, periodically sent e-mails to prompt individuals to complete the modules they had not yet visited, and responded to any requests for technical assistance. E-mail prompts were an intentional component of the intervention design as other Internet-based interventions and research studies have successfully used such prompts to encourage use and return visits to online resources.<sup>34</sup> The study nurse also monitored participants' levels of pain via an online self assessment tool to ensure that participants were protected from the potential harm of inappropriately relying on the intervention without seeking additional medical advice in the event of significant pain. Over the study period, 7 people reported scores above 6 on a scale of 0 (no pain) to 10 (pain as bad as you can imagine) (see Materials). The study nurse informed the RA in such instances, who subsequently contacted participants to inquire as to what they were doing to manage their pain and/or to advise the participant to seek medical advice from a health care professional. In all instances, these participants had already contacted a physician or could explain how they were managing their pain. No one requested a referral, and in subsequent online sessions their pain scores decreased.

Denying any participants access to the intervention would have presented an ethical dilemma, since there is evidence that cognitive-behavioral and other psychosocial treatments are effective<sup>16, 60</sup> and the project was being conducted by a social service agency. For this reason, comparison group participants were given access to the online intervention after completing the follow-up assessment at 6 weeks. At the end of the study period, 17 participants from the comparison group (46%) had also visited the intervention web site. All data regarding online visits to the intervention were tracked by individual. For this study, our analysis focused solely on the intervention group's use of the site.

## Materials

At baseline, we administered several measures for the purpose of describing demographic characteristics, Internet use, experiences with pain management, and health-related quality of life among participants. Quality of life was assessed using the 14 item Health Related Quality of Life (HRQOL-14) instrument from the Centers for Disease Control and Prevention.<sup>10,40</sup> This instrument measures self reported health status, unhealthy days, activity limitations, and experiences with various physical and mental health symptoms, measured as number of days in the last 30 days. The 4-item Healthy Days Core Module and 5-item Healthy Days Symptom Module showed strong psychometric properties in a sample of people with arthritis<sup>38</sup> and the HRQOL has also been used in studies of pain among older adults.<sup>14,46</sup> The healthy days measures are internally consistent and have sufficient criterion validity for use in community surveys.<sup>10,39</sup>

## Pain

Pain intensity was measured with the Brief Pain Inventory-Short Form (BPI).<sup>11</sup> The BPI is widely used to assess pain symptoms and has demonstrated sufficient validity and reliability in medical and nonmedical settings.<sup>28,36,66</sup> Cronbach's  $\alpha$  for the BPI ranges from .77 to .91.<sup>63</sup> This tool includes several items that assess the location of pain and the intensity of pain in different time frames using a Likert scale ranging from 0 (no pain) to 10 (pain as bad as you can imagine). There is no scoring algorithm, but "worst pain" or the arithmetic mean of the 4 severity items can be used as measures of pain severity. An additional, immediate measure of pain was incorporated into an online survey (using the "pain right now" item from the BPI), completed by intervention group participants when they logged on and off the web site. Finally, the pain interference subscale of the BPI was used to measure limitations due to pain; the 7 items address to what degree pain interferes with various aspects of daily life in the past 24 hours. An arithmetic mean of the 7 interference items was used as a measure of pain interference.<sup>47</sup>

## Self-Efficacy

We measured self-efficacy with the Pain Self-efficacy Questionnaire (PSEQ), a 10-item instrument that assesses confidence in ability to do things despite pain, with responses on a Likert scale ranging from 0 (not at all confident) to 6 (completely confident). The PSEQ had acceptable internal consistency (Cronbach's  $\alpha = 0.92$  and  $0.93$ ). It also had acceptable test-retest reliability over a 3-month period ( $r = .73$ ).<sup>2</sup> The PSEQ can be used as a screening instrument and to detect change over time. A score of less than 17 suggests substantial need for a pain management intervention. Conversely, a post-intervention score of approximately 40 suggests that maintenance of gains from the intervention is likely. A score of 30 is less predictive of maintenance in gains and individuals may be at risk of relapse.<sup>44,45</sup>

## Depression

We measured depression with the Center for Epidemiologic Studies Short Depression Scale (CES-D 10), a shortened version of the CES-D.<sup>57</sup> The CES-D is a widely used measure of depression in both community-dwelling and medically ill older adults.<sup>25</sup> The CES-D has good internal consistency (Cronbach's  $\alpha = 0.92$ ) and high test-retest reliability ( $r = .83$ ).<sup>25</sup> Sensitivity was 97%, specificity was 84%, and positive predictive value was 85%. This instrument does not have any established cutoff scores, but scores equal to or greater than 8 or 10 have been used as indicators of depression for screening purposes.<sup>23</sup>

## Anxiety

The 6-item State-Trait Anxiety Inventory (STAI-6) was used as a brief measure for anxiety,<sup>32</sup> based on the full version of the State-Trait Anxiety Inventory (Form Y) (STAI-Y).<sup>55</sup> It assesses state anxiety (how one feels at the moment), with higher scores indicating a higher level of anxiety. The 6-item short-form was found to have correlation coefficients greater than .90, producing similar scores to the full 20-item STAI-Y state subscale for state anxiety.<sup>32</sup> The developers of the STAI-6 did not calculate test-retest reliability as reliability is low for state anxiety due to its transitory nature.<sup>32</sup> For the full STAI-Y, the median  $\alpha$  coefficients were .93 for scores on the state scale; test-retest coefficients ranged from .16 to .62 for the state scale.<sup>55</sup>

## Awareness of Responses to Pain and Confidence in Pain Management

Self-awareness of responses to pain was documented using a Pain Awareness Questionnaire (PAQ) developed for the purpose of this study. This tool included 5 items related to self-awareness of responses to pain and 2 items related to confidence in ability to manage pain. These items were developed based on the expected outcomes of the mind-body intervention and a review of research articles. The tool was pilot-tested for understanding of items and response categories with a sample of 5 middle-aged to older individuals who had previous or current experiences with chronic pain. The wording of questions and response categories was revised based on individuals' explanations of how they interpreted the items and responses. Responses ranged from 4 (most of the time) to 1 (rarely or never), with a 0 response for "not sure."

## Self-Care

Baseline and follow-up surveys developed for the purpose of the study included items to track changes in how frequently participants used self-care techniques and whether they used techniques they had learned in the intervention when they were not online. In addition, the online log off survey included several questions regarding participants' expectations for using the techniques they learned in the modules in their daily routines.

## Satisfaction and Use of the Intervention

A satisfaction survey developed for the purpose of the study was administered to those who used the interven-

tion. The survey addressed overall satisfaction with the intervention as well as the helpfulness of specific modules or aspects of the intervention. To document use of the intervention, we tracked visits to the site using an online user database, including how often and for how long participants visited each module.

## Analysis

All quantitative data were entered into an SPSS database (SPSS, Inc., Chicago, IL)<sup>56</sup> for purposes of analysis. First, frequency distributions were generated to examine missing data, out of range scores, and logical distribution of response options, and all measures were scored. We calculated an imputed score for standardized scales that were missing no less than 10% of the responses, with the exception of the CES-D 10 for which instructions suggest creating a total score when up to 2 of 10 responses are missing. Distributions of continuous and categorical data were examined, and low-frequency categories were pooled to ensure normality. Quantitative data were analyzed using an  $\alpha$  level of 0.05 in all tests of statistical significance. Reliability estimates were obtained for all instruments using the study data.

Demographic characteristics were compared for participants who completed the study and those who dropped out. Descriptive statistics were used to describe the profiles of participants and to compare demographic characteristics for the intervention versus comparison groups. Independent *t* tests were used to examine baseline scores to determine if the random assignment to groups adequately controlled for demographic differences at baseline. We analyzed data for all outcomes by using a covariance model (ANCOVA).

To test our hypotheses, we determined whether the scores on each instrument were significantly different between groups after controlling for differences at baseline. We also estimated observed power using ANCOVA. In addition, we computed change scores by subtracting the baseline score from the follow-up score and used independent *t* tests to determine if the groups were similar in the amount of baseline to follow-up change.

Data from the online survey are based on a total of 1222 log-on surveys and 821 log-off surveys; results of pain scores were calculated as means for the full intervention group across all completed surveys (ie, across all visits to the site for which participants also completed the online survey item). Frequencies and percentages were calculated for responses to other items on the online surveys. Qualitative data from participants' comments on open-ended questions in the satisfaction survey were entered into SPSS (SPSS, Inc.) as text and were summarized for themes regarding participants' experiences with using the intervention.

## Results

### Description of the Sample

The majority of the 78 participants were women, 75.6% were under the age of 70 years, with a mean age

of 65.8, and well over half were single. The sample was racially diverse; 44% were African American and 50% were Caucasian. The sample was well-educated, with the majority having received at least some college education or beyond. However, participants reported a variety of income levels: A total of 70.1% had incomes less than \$50,000, whereas 20.9% had incomes less than \$20,000. A summary of participant characteristics is presented in Table 1. Preliminary analysis showed nonsignificant differences in baseline mean scores between the intervention and control groups for all outcome measures ( $n = 89$ ). There were no significant differences between groups on demographic variables. Thus, the findings reported for the final sample of 78 are likely to be similar to findings for the initial sample of 89.

Overall, participants' health-related quality of life was somewhat worse than national norms for age groups between 55 to 74 years, based on national prevalence

**Table 1. Participant Characteristics**

	INTERVENTION GROUP N = 41		COMPARISON GROUP N = 37		TOTAL N = 78	
	freq	%	freq	%	freq	%
Mean age	64.3		67.5		65.8	
Age range	55–80		57–91		55–91	
Women	36	87.8	32	86.5	68	87.2
Race/ethnicity						
Caucasian (not Hispanic)	22	53.7	17	45.9	39	50.0
African American (not Hispanic)	18	43.9	17	45.9	35	44.0
Hispanic/Latino	1	2.4	2	5.4	3	3.8
Other	0	0	1	2.7	1	1.3
Marital status						
Married	13	31.7	12	32.4	25	32.1
Separated/divorced	16	39.0	14	37.8	30	38.5
Widowed	8	19.5	8	21.6	16	20.5
Never married	3	7.3	3	8.1	6	7.7
Other	1	2.4	0		1	1.3
Educational level						
HS grad	2	4.9	5	13.5	7	9.0
Some college	15	36.6	8	21.6	23	29.5
College grad	16	39.0	14	37.8	30	38.5
Graduate school	8	19.5	10	27.0	18	23.1
Income level*						
Less than \$9,999	3	8.6	1	3.1	4	6.0
\$10,000–\$19,999	2	5.7	8	25.0	10	14.9
\$20,000–\$49,999	18	51.4	15	46.9	33	49.3
\$50,000–\$99,999	11	31.4	7	21.9	18	26.9
\$100,000 or more	1	2.9	1	3.1	2	3.0
Religious affiliation						
Protestant	19	46.3	16	43.2	35	44.9
Catholic	5	12.2	8	21.6	13	16.7
Jewish	11	26.8	9	24.3	20	25.6
Other	2	4.9	2	5.4	4	5.1
No affiliation	4	9.8	2	5.4	6	7.7

\*Five people in the comparison group and 6 in the intervention group did not respond to the question regarding income level.

data for the HRQOL.<sup>41</sup> Sixty-seven participants (88.2%) had at least an intermediate or higher level of experience using the Internet, yet only 18 (23.1%) reported that they currently used the Internet to find strategies or techniques for managing their pain. Only one person reported using Internet chat rooms, listservs, or online support groups for people experiencing pain.

At baseline, each participant identified from 1 to 9 conditions as contributing to their pain, with a mean of 2.75 conditions. Across the full sample, participants identified an estimated 38 different conditions causing their pain. The most common causes of pain cited by participants were arthritis, spinal stenosis or degenerative disc problems, previous injuries or surgery, and sciatica.

Nearly half of participants (46.2%) reported they had not used any alternative treatments before using the intervention. For those who did, massage, chiropractics, and herbal treatments were most commonly used. However, most participants (93.6%) reporting using one or more self-care techniques, with 70.1% using such techniques on a daily basis. The most common techniques used were physical exercise, distraction, prayer, breathing, relaxation, and meditation. In addition, 5 people used psychotherapy and 11 used support groups as a way to manage their pain.

### Use of the Intervention

The median number of visits for all participants in the intervention group ( $n = 41$ ) was 22.5 visits over the course of the 6-week intervention period; 1 participant visited the site 211 times. At log off, 78% of the time participants indicated that they planned to use 1 or more exercises on their own while offline. The exercises they planned to use were from the following modules, listed in order of most to least mentioned: Relaxation, breathing, appreciation and pleasure, visual expression, and writing exercises. In addition, we asked a similar ques-

tion on the follow-up satisfaction survey; 95.3% of participants ( $n = 43$ , including 2 participants from the comparison group) stated that they had used the self-care techniques they learned from the intervention without going online. Although participants reported using techniques from all of the modules, relaxation and abdominal breathing techniques were most commonly mentioned (by 74.4% and 69.8% of participants, respectively).

### Reliability of the Outcomes Measures

We ran Cronbach's alpha and found acceptable to good reliability of each instrument when used in the study sample. For the BPI,  $\alpha = 0.89$  at time 1 and 0.88 for time 2; for the PSEQ,  $\alpha = 0.92$  for time 1 and 0.89 for time 2; for the CES-D 10,  $\alpha = 0.81$  for time 1 and 0.85 at time 2; for the STAI-6,  $\alpha = 0.80$  for time 1 and 0.85 for time 2. We also examined the internal consistency and reliability of the 5 awareness items using data from the full sample. When we combined the 2 time points, the internal consistency was acceptable ( $\alpha = 0.81$ ), but separately for baseline and follow-up the internal consistency was much lower ( $\alpha = 0.68$  and 0.58, respectively).

### Efficacy of the Intervention

In the ANCOVA analysis, we found no significant between-group differences for any of the outcomes except Awareness of Responses to Pain. Changes in outcomes from baseline to follow-up assessment showed improvements in some but not all outcome measures. These results are reported below and are based on total sample size unless otherwise indicated. When responses are missing, percentages are reported as valid percentages.

### Pain Intensity

At baseline, participants reported moderately high levels of pain on the BPI with a mean score of 6.23 (SD 2.38)

**Table 2. Primary Outcome Measures From Baseline to Follow-Up by Group**

OUTCOME MEASURE	INTERVENTION GROUP <i>N</i> = 41			COMPARISON GROUP <i>N</i> = 37		
	T1	T2	DIFF.	T1	T2	DIFF.
Pain intensity (BPI)						
Worst pain	5.98 (2.54)	4.71 (2.89)	-1.27* (2.88)	6.51 (2.19)	5.57 (2.36)	-0.94* (2.04)
Least pain	3.39 (2.66)	2.34 (2.15)	-1.05 <sup>†</sup> (2.81)	3.49 (2.20)	2.54 (2.01)	-0.95* (2.05)
Average pain	5.20 (1.94)	4.56 (1.83)	-0.64* (1.48)	5.43 (1.74)	4.73 (1.84)	-0.70 <sup>†</sup> (1.82)
Average mean of 4 intensity items	4.54 (2.08)	3.68 (2.00)	-0.86* (2.03)	5.01 (1.83)	4.02 (1.81)	-0.99* (1.58)
Pain interference (BPI)						
Average mean of interference Subscale	4.21 (2.74)	3.00 (2.41)	-1.21* (2.44)	3.95 (2.16)	3.07 (2.24)	-0.88* (2.08)
Self-efficacy (PSEQ)	43.66 (13.83)	45.49 (11.73)	1.83 (8.72)	43.68 (11.91)	44.24 (11.53)	0.56 (12.40)
Depression (CES-D)	10.06 (6.25)	8.56 (6.53)	-1.50 (5.82)	9.70 (5.18)	10.07 (6.36)	0.37 (5.14)
Anxiety (STAI Y-6)	11.54 (4.22)	10.90 (4.77)	-0.64 (4.74)	10.41 (3.53)	11.32 (3.88)	0.91 (3.28)

Abbreviations: BPI, Brief Pain Inventory; PSEQ, Pain Self-efficacy Questionnaire; CES-D, Center for Epidemiologic Studies Short Depression Scale; STAI Y-6, State-Trait Anxiety Inventory Form Y and 6-item.

\*Statistically significant at the .01 level.

<sup>†</sup>Statistically significant at the .05 level.

\*Statistically significant at the .000 level.

**Table 3. Awareness of Responses to Pain and Confidence With Managing Pain (PAQ)**

	INTERVENTION GROUP N = 41			COMPARISON GROUP N = 37		
	T1	T2	DIFF.	T1	T2	DIFF.
Awareness subscale, mean of 5 items	16.55 (3.17)	17.10 (2.37)	0.55 (3.07)	16.70 (3.45)	16.05 (3.81)	-0.65 (3.61)
Can manage pain	3.32 (0.72)	3.39 (0.95)	0.07 (0.99)	3.27 (0.99)	3.57 (0.73)	0.30 (1.02)
Can use self-care techniques to manage pain	2.41 (1.34)	3.22 (0.79)	0.81* (1.27)	2.70 (1.43)	2.54 (1.46)	-0.16 (1.80)

Abbreviation: PAQ, Pain Awareness Questionnaire.

\*Statistically significant at the .000 level.

out of 10 for worst pain in the last 24 hours (Table 2). The mean score for the group across all 4 pain intensity items (worst, least, average, and right now) was 4.77 (SD 1.97), within the range of moderate pain on the BPI. These scores indicate that the intervention reached the target population; higher scores would have suggested acute rather than chronic pain and participants with lower scores would have little to no room for improvement. At follow-up, there were statistically significant improvements in worst, least, and average pain, as well as in the average mean of the 4 pain intensity items for both the intervention and comparison groups (Table 2). There were no statistically significant differences in gains from baseline to follow-up between the intervention and comparison groups. In addition, for the intervention group, the online mean pain intensity scores for “pain right now” decreased nearly a full point, from 4.14 to 3.17, from log on to log off across all visits for all participants.

### Pain Interference

Participants reported a moderate level of interference with activities due to pain on the BPI subscale at baseline. The average of mean scores for the 7 items was 4.08 (SD 2.47). At follow-up, there were within-group, statistically significant improvements in pain interference for both the intervention and comparison groups but no statistically significant differences between groups from baseline to follow-up (Table 2).

### Self-Efficacy

At baseline, participants had moderately high levels of pain self-efficacy on the PSEQ (belief they can do things despite pain), with a mean score of 43.67 (SD 12.87) of a total possible score of 60. Therefore, there were only small improvements in pain self-efficacy for both the intervention and comparison group from baseline to follow-up, and these changes were not statistically significant (Table 2).

### Depression and Anxiety

Participants' baseline scores suggested they were experiencing only modest levels of depression, on average, with a mean score of 9.89 (SD 5.73) on a scale of 0 to 30, as measured by the CES-D 10. A cutoff score of 8 or 10 on the CESD has been used for screening purposes.<sup>23</sup> Participants also reported moderate anxiety levels, on aver-

age, with a mean score of 11.00 (SD 3.93) on a scale of 6 to 24, as measured by the STAI-6. These baseline scores suggest that participants were in relatively good mental health. Although not statistically significant, there were slight improvements in depression and anxiety for the intervention group as opposed to the comparison group (Table 2).

### Awareness of Responses to Pain

Using a computed total score for the 5 items on the PAQ that pertain specifically to awareness of responses to pain, participants scored a mean of 16.62 of a possible 20 (SD 3.29), suggesting that, on average, they were aware of their responses to pain “some of the time” at baseline. Although not statistically significant, there was an increase in awareness from baseline to follow-up for the intervention group and a decline in awareness for the comparison group (Table 3). However, there was a statistically significant between-group difference for this outcome.

### Confidence With Pain Management

Two items on the PAQ measured confidence in ability to manage pain (Table 3). On average, at baseline participants believed that they could effectively manage their pain some of the time (with a mean score of 3.29, SD 0.85), yet they less often believed that they could use nonmedical self-care techniques to do so (2.55, SD 1.38). For the latter item, at follow-up, participants in the intervention group showed statistically significant increases in their confidence to use nonmedical self-care techniques to manage pain, whereas those in the comparison group showed a slight decrease in confidence (not statistically significant).

### Self-Care

Baseline and follow-up satisfaction surveys also included a question pertaining to how often participants used self-care techniques to manage pain. The percentage of intervention group participants who reported that they were using self-care techniques daily increased from baseline (73.2%) to follow-up (85.4%). However, the daily use of self-care techniques increased at a similar rate for the comparison group (66.7%–75.0%).

Although there was sufficient power to detect change, the power analyses conducted separately by instruments used showed the samples were too small to be able to

detect significant between-group differences. The observed power to detect between-group differences ranged from 0.06 (least pain) to 0.52 (pain awareness), which was far below generally the acceptable level of 0.80. For the least powerful measure, the difference between groups was approximately one-third their standard deviation. Assuming a between-group difference of a half standard deviation, a sample of approximately 60 cases in each group would be needed to achieve power = 0.80 at  $\alpha = 0.05$ . This sample size would be more likely to demonstrate statistically significant results in future testing of this intervention.

### **Participant Satisfaction**

All participants in the intervention group and 2 of the waiting list comparison group participants who used the site after their follow-up interviews completed satisfaction questions on the follow-up survey; results are based on a total sample of 43 participants (Fig 1). Overall, 81.4% of participants believed that the intervention was helpful or very helpful, and 88.4% found the site easy or very easy to navigate. Nearly everyone (95.3%) would recommend the intervention to others. All modules were found to be helpful or very helpful by a majority of participants who used them, although some were found more helpful than others: A total of 90.5% of participants believed that the relaxation module was helpful, as did 85.4% for abdominal breathing, 78.3% for appreciation and pleasure, 70.0% for appreciative writing, 66.7% for planning for change, 62.1% for visual expression, and 57.5% for writing about difficult experiences. For those who used them, 95.1% ( $n = 41$ ) believed that the examples or illustrations were helpful or very helpful; 75% ( $n = 36$ ) and 81.3% ( $n = 32$ ), respectively, believed that the response and the action plan worksheets were helpful or very helpful.

In open-ended responses on the satisfaction survey, participants commented on the user-friendly nature of the web site, as well as the value of having access to comprehensive information and a variety of choices of self-care techniques at their convenience. Several noted that having the intervention available confirmed that someone was concerned about their pain. Many commented that the explanations were clear and the positive tone of language used on the site made it very accessible. One commented it "felt like you were talking to me," whereas others noted that it was "soothing" or "fun." Several people noted that the intervention made them more aware of their pain experience and/or encouraged them to focus on self-care. For example, one individual explained that the intervention did not allow her to ignore the pain; she had no choice but to "delve" into her thoughts on self-care. Another stated that it "motivated me to do what I was already aware of . . . it kept me on track," whereas another commented, "it gave me strength." One person mentioned the value of being able to learn how to express her pain to a doctor.

About half of those who completed satisfaction surveys provided suggestions for how to improve the intervention, the majority of which related to expanding the

site with additional topics, more exercises, and links to additional resources on the web. Four participants thought that the content of the intervention might benefit from additional introductory text to orient users how to move through the various modules and encourage them to explore different modules to find what best suits them. Three people made suggestions for changing the layout or format of the web site such as expanding the menus, shortening the amount of text on 1 page, or moving the location of links. One person suggested adding an online venue for communicating with other users.

Ten participants had limited difficulties using the site: of these, 4 reported occasional problems with logging on and 4 reported some difficulties with navigating the site, 6 people had trouble downloading worksheets, and 2 had difficulty accessing portions of the site because they had only dial-up connections. In terms of the content of the intervention, 2 people disliked the worksheets, which were optional tools for self reflection, and 1 person did not like some of the graphics and voices in the audio modules. Only 2 individuals did not believe that "they got much out of" the intervention, one of whom was "bored" and thought that it was "time-consuming." A few participants were initially skeptical of the benefits of mind-body techniques but eventually found them to be helpful. One man explained how he was able to change his view of self-care and how the intervention benefited him and his family by making him easier to live with. Overall, the majority of participants made positive comments and expressed a desire to have access to more exercises, confirming quantitative results regarding participant satisfaction.

### **Discussion**

This study contributes to the limited research on the effectiveness of online pain management interventions and is unique in that it targets older adults. Findings suggest that the intervention may be associated with some improvement in outcomes over a period of 6 weeks. There was a statistically significant difference between groups in awareness of responses to pain, with the intervention group showing improvements and the comparison group showing decline. In addition, there were statistically significant improvements in pain intensity and pain interference for both the intervention and comparison groups, as well as an improvement in confidence with using nonmedical self-care techniques to manage pain for the intervention group, but not the comparison group. Together these findings, along with improvements in mean online pain scores reported by the intervention group, provide some support for our initial hypotheses. However, the sample size lacked adequate power to demonstrate between group differences in most outcomes.

These modest findings confirm other research reports of associations between interventions with behavioral-cognitive components and reduced pain<sup>15,33,54,60,62,65</sup>; improved sense of control over pain, pain self-efficacy,

confidence in ability to manage pain, and coping abilities<sup>15,53,62,60,65</sup>; and reduced interference with daily activities, increased activity levels and improved physical functioning.<sup>35,54,62</sup> Our findings did not substantiate findings regarding associations between similar interventions and reduced depression<sup>7,35,53,62,65</sup> or anxiety.<sup>7,35,53,60,62</sup>

More importantly, our findings demonstrate the feasibility of providing a mind-body intervention online. A majority of participants found the intervention to be helpful and easy to use, and they were likely to continue to use the techniques they learned online in their self-care routines. For those who had used mind-body self-care techniques previously, the site served as a tool for focusing on self-care. Finally, we may have reached individuals who do not normally seek out mind-body exercises on their own. For such individuals, who may be unaccustomed to alternative approaches for managing pain particularly in the presence of others, learning mind-body techniques in a private setting and at a time of one's choosing may be more acceptable and ultimately, more empowering.

Although most interventions have involved younger or mixed-age populations, our findings support existing evidence that older adults will use cognitive-behavioral interventions and may experience benefits.<sup>12,53,62</sup> Other online interventions addressing chronic back pain, headaches, and chronic disease have demonstrated reductions in pain, disability, role function, health distress, depression, pain catastrophizing or other maladaptive coping strategies, physician visits, and hospital days, as well as improvements in self-efficacy, control over pain, functioning, and activity levels.<sup>1,8,30,31,58</sup> Most such online cognitive behavioral interventions included other forms of support (eg, telephone support, e-mail or online discussion venues).<sup>8,30,31</sup> However, one study found that similar benefits are associated with an Internet-based pain management intervention, whether provided as a stand alone program or with additional e-mail or telephone support.<sup>1</sup> Our results further confirm the potential value of a stand alone web-based intervention.

Although the majority of participants in our study had positive experiences with the intervention, individuals who discontinued their participation may have had negative experiences. Some individuals may have found study requirements for accessing the intervention to be too time-consuming, may have had difficulty using the intervention online, or did not find the intervention to be helpful for them. The content of the intervention would benefit from relatively simple additions to the orientation pages and reducing the amount of text on other pages. Improving users' ability to access and navigate the intervention can be easily addressed via minor changes to log in features, navigation links, and formatting, although improving access to the audio components for dial up users is problematic.

The characteristics of individuals who volunteered for this online self-care pain management intervention have implications for identifying target populations and developing outreach strategies. There was substantial in-

terest in the project across both younger and older persons in the target population of 55 and older, which suggests that this intervention may appeal to people who are at various stages of their experience with chronic pain. Furthermore, the intervention appealed to people with a wide range of chronic pain-related conditions. This confirms existing findings that those who experience pain that interferes with functional ability or who have multiple health problems may be more likely to use alternative approaches to self-care.<sup>42</sup>

At the same time, study participants were most likely to be female, which suggests that an online mind-body intervention may appeal more to women than men. Other researchers have reported that women as opposed to men are more likely to use alternative health care approaches.<sup>42</sup> Other gender differences in pain beliefs and experiences are likely to affect the use of mind-body interventions. For instance, women tend to report lower pain thresholds, seek out health care for pain more often and earlier, have more varied coping strategies than men, and focus on strategies that reduce distress and hence may be more inclined to use alternative pain management interventions.<sup>18,24,27,42,51</sup> There is also some evidence that women are more likely to turn to the Internet for health information.<sup>20,21</sup>

The results of this study clearly demonstrate the feasibility of providing online tools for pain management, yet there are several limitations that affect the interpretation of results regarding outcomes. The modest changes in outcomes for the intervention group may in part be due to the short length of the intervention, which was only 6 weeks. Unanticipated improvements among those in the waiting list comparison group may have been due to several factors. It is possible that participants anticipated future access to the site and, hence, began to pay more attention to how they managed their pain. Several participants commented that participating in the initial interview increased their overall awareness of how they manage pain. It is also possible that those who volunteer for a pain management intervention may have experienced recent heightened pain and were therefore more willing to participate in such a study; after enrolling in the study, their symptoms may have decreased. Finally, participants may have reported improvements due to social desirability bias or a desire to have future access to the intervention as an ongoing service from the sponsoring agency.

Furthermore, the findings cannot be generalized to a broader population due to the small sample size, the use of a convenience sampling strategy, and the potential bias in the characteristics of those who volunteered for the study. Older people who volunteer for an online intervention and who have access to the Internet are likely to have different characteristics from the general population of those in chronic pain. This may in part explain the high pain self-efficacy scores at baseline; those with high self-efficacy may be more likely to seek out options for self-care techniques that they can use on their own, without additional support.

Although this study contributes to research assessing cognitive-behavioral interventions specifically for older

adults as compared with younger adults, interventions targeting this age group deserve further attention as chronic pain is particularly prevalent in older populations. Examining differences in outcomes across age groups would not only determine if such interventions are equally beneficial for older adults but would also identify factors that need to be taken into account in the design of cognitive-behavioral or mind-body interventions for different age groups. Although there is a growing body of research that demonstrates the benefits of cognitive-behavioral and mind-body approaches for the management of chronic pain, there are few studies of the outcomes of online interventions that use such approaches with older people. This is a critical area for research as future cohorts of older adults are more likely to be accessing the Internet.

This study has demonstrated that older adults will use and can benefit from a relatively short-term online intervention that provides easy to use mind-body self-care techniques. Such an intervention may empower older adults in chronic pain to engage in self-care, focus on managing pain in a positive way, and integrate what they learn into their daily routines. Thus, an online mind-body intervention can be suitable for older adults who have various and multiple health problems. Although

this study targeted older adults, such interventions are also amenable for use by adults of younger ages, as the techniques and exercises are not specific to older people. Reaching those in chronic pain can be a challenge, as pain often limits mobility and leads to social isolation and depression, thereby undermining motivation to engage in self-care or attend educational sessions. Those who are unwilling or unable to travel to classes or who are reluctant to learn techniques in a group setting may especially appreciate the convenience and privacy of online classes. Offering mind-body self-care techniques via the Internet is a promising strategy for complementing medical care and face-to-face education for older adults and others in chronic pain.

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