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An Online Self-Help CBT Intervention for Chronic Lower Back Pain

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INTRODUCTION

Lower back pain is one of the most widely experienced health problems in the United States, is a leading cause of disability, and has an estimated cost of \$30 to \$70 billion yearly.¹ A 2008 epidemiological survey found that chronic lower back pain (CLBP) was prevalent in 10% of Americans,² while previous studies have found prevalence to be as high as 28%.³ According to the Healthy People 2010 report, 70% to 85% of people report back pain at some time in their lives,¹ making it the most frequent cause of activity limitation for persons under the age of 45.^{4,5} Furthermore, the incidence of lower back pain-related disability is increasing as the baby boomers age.⁶ In sum, CLBP is a significant public health problem.

Managing chronic pain, including CLBP, often necessitates both pharmacological and non-pharmacological strategies. The Joint Commission, which accredits and certifies more than 18000 health care organizations and programs in the United States, specifically requires that pain management plans include non-pharmacological methods of pain control for patients in both inpatient and outpatient settings. Despite this requirement and strong recommendations by a number of other prominent organizations and associations that non-pharmacological methods of pain control be an integral part of pain management strategies,⁷ there continues to exist evidence that non-pharmacological strategies are under-utilized.^{8,9}

Cognitive and behavioral therapy (CBT) approaches to pain management have been used with chronic pain patients for many years¹⁰ and were found by a recent review to be effective treatment for CLBP.¹¹ Strategies such as cognitive restructuring, relaxation, meditation, goal setting, pacing, activity scheduling, values clarification, and communication skills training are just a few examples of the many viable and cost effective cognitive and behavioral strategies for chronic pain. These techniques have few if any negative side effects and, once learned, can be used by patients nearly anywhere and anytime. A meta-analysis of 22 randomized controlled trials concluded that psychological interventions are effective for CLBP, with cognitive-behavioral and self-regulatory (e.g., biofeedback, relaxation) interventions being particularly effective.¹²

Cognitive restructuring, in particular, has been shown to be a critical component of CBT pain management. Pre-to post-treatment changes in specific factors targeted by cognitive interventions (e.g., attitudes towards coping, disability beliefs, and catastrophizing) are correlated with improvement in pain severity, disability, and distress.^{13–19} Particularly noteworthy is across-lagged panel analysis by Burns et al¹³ that showed that early-treatment

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cognitive change predicted late-treatment outcome but not vice-versa, even when controlling for improvement in depression.

Beyond the more traditional cognitive behavioral approaches, two functional contextual approaches have been identified as being important in chronic pain treatment: acceptance and values-based action.²⁰ Acceptance refers to the willingness to experience pain or other distressing events without attempts to control them. Values-based action refers to the aligning of actions with desired, personally meaningful purposes rather than with the elimination of unwanted experiences.^{21,22} Integrating functional contextual interventions into their multi-disciplinary pain program, Vowles and McCracken²³ found that improvement in pain acceptance and values-based action predicted improvement in primary outcomes including pain-related anxiety, depression, and disability.

Although CBT is traditionally delivered by professionals in one-on-one or group formats, self-help interventions for chronic diseases such as chronic pain are cost-effective, more easily disseminated than traditional, professional-led interventions and serve to empower patients.²⁴ A review of self-help for chronic pain²⁵ found that self-help delivered via group formats, workbooks, books, audiotapes, minimal contact formats, and telephone delivery systems has been effectively used to reduce pain, pain-related disability, depression, and anxiety in arthritis,^{26,27} lower backpain,^{28,29} headache,^{30–32} and temporomandibular joint disorder.^{33,34} Internet-based self-help interventions for chronic pain have been shown to be effective for a number of pain conditions, including headache,³⁵ non-headache chronic pain,³⁶ and rheumatoid arthritis, osteoarthritis, or fibromyalgia.³⁷

This paper reports on the efficacy of a pilot version of an online CBT intervention, entitled the Wellness Workbook (WW), for individuals suffering from CLBP. The WW is an interactive, web-based self-help intervention consisting of a mind/body treatment rationale, pain education, and CBT techniques including cognitive restructuring, stress management, relaxation training, mindfulness, and values-based behavioral activation. The WW was evaluated in an online randomized wait-list controlled trial in a sample of CLBP patients recruited via the internet.

MATERIALS AND METHODS

Intervention

The pilot version of the WW consisted of six sequential chapters comprising 189 pages:

1. *Introduction.* Defines chronic pain, describes differences between acute and chronic pain.
2. *All About Pain.* Defines pain and its functions and introduces a mind/body treatment rationale. It includes a summary and description of a variety of approaches to pain treatment and ends with a justification for taking a biopsychosocial approach to pain management.
3. *Thoughts and Pain.* Presents the rationale for intervening with thoughts to affect pain and mood and delivers skills training for increasing awareness of thinking patterns, evaluating thoughts, disputing and replacing thoughts, and cognitive reframing as well as training in accepting and disregarding thoughts.
4. *Stress and Relaxation.* Presents a rationale for the use of stress management as a pain management strategy and offers skills training in diaphragmatic breathing and instruction on how to use breathing as a stress management tool during daily life.

5. *Getting Active*. Teaches behavioral activation and includes emphases on increasing physical activity, values clarification, and pleasant events scheduling as well as goal setting training and motivation.
6. *Relaxation and Meditation*. This chapter includes examples of longer (15 to 20 minutes) relaxation exercises such as progressive muscle relaxation, guided imagery exercises, and mindfulness meditation.

Each chapter was designed to take between 1 and 1.5 hours to complete. The basic outline of each chapter was as follows:

- chapter goals
- open-ended questions about use of strategies taught in the previous chapter (“checking in”)
- didactic material and interactive exercises relating to the primary chapter topic
- didactic material on mindfulness and meditation instruction
- chapter summary reiterating the main teaching points of the chapter
- examples of how to practice new skills and integrate strategies into daily living with printable tracking forms (“try it on your own”)

In order to maximize participant engagement and learning, a variety of instructional modalities were incorporated:

- Didactic instruction. Text and graphics supplemented by audio narration.
- Animation. Information is presented in animated pictorial format that makes complicated concepts or biological functions more easily understood.
- Patient stories. Two patient characters provide first-person audio-recorded narratives (with photos) describing use of techniques taught in the workbook, obstacles overcome, learning process, success stories, etc. Stories are fictional amalgamations of actual patients.
- Reflective exercises. Users are asked a question and respond by typing their answer in a text box. These exercises are primarily designed to increase self-awareness.
- Interactive exercises. Users are asked to interact with material presented on the computer. There are many types of interactive exercises, including drag and drop (e.g., matching unhelpful thoughts to their category), fill in the blank (with feedback), and skill practice (e.g., identifying thoughts that would generate positive, negative or neutral emotions, listing unhelpful thoughts and challenging them). Interactive exercises can use examples from the user’s life experience or fictional examples. Feedback is provided where appropriate either as an example of a target answer or the correct answer with an explanation.
- Guided relaxation and meditation exercises. These MP3 recordings can be played on the computer or downloaded to an MP3 player. The Workbook includes diaphragmatic breathing instruction, guided imagery, progressive muscle relaxation, and a number of mindfulness meditations, including body scan, walking meditation, breath-focused, and pain-focused.

Therapeutic content was drawn from established and empirically-supported cognitive and behavioral strategies, including cognitive therapy, behavioral activation, acceptance and commitment therapy, and mindfulness-based stress reduction. The first author, a clinical psychologist, was responsible for leading the content development efforts. Expert clinical consultants from pain medicine and pain psychology reviewed all content, as did an Internet

instructional design expert. Revisions were made to the content based on feedback from the consultants. Text was kept at a sixth to eighth grade reading level and was evaluated by the FOG method³⁸.

Participants

For a period of 2.5 months, individuals with CLBP were recruited via Internet bulletin boards (e.g., Craigslist) and advertisements in mainstream and alternative newspapers in cities chosen for ethnic diversity (e.g., Houston, Atlanta, New York). The advertisements noted that individuals with lower back pain could earn up to \$135 for testing an online workbook and completing assessments. Interested individuals called the study coordinator and were screened by phone. During the screening interview, study procedures (randomization, time required, assessments, payment, using the WW, etc.) were explained to potential participants. Eligibility criteria provided for the inclusion of individuals aged 21 years or older who: 1) self-identified as having had non-cancer related lower back pain for at least 6 months, 2) reported an average pain rating of 4 or above for the past week (0 to 10 scale), 3) had access to a computer with audio capabilities, an Internet connection, and a working email account, 4) could read and write in English, and 5) had not participated in a multidisciplinary program or CBT for chronic pain within the past three years. Due to a preponderance of participants in their twenties and thirties, mid-way through the study the minimum age for eligibility was raised to 40 years old in order to recruit a sample more representative of the general chronic pain population.

A total of 230 potential participants were screened for this study, and 66 were found to be ineligible, primarily due to young age (77%) or low average pain rating (14%). Figure 1 includes additional detail on reasons for ineligibility. The 164 individuals who were found to be eligible were given a user ID and password to login to the study website to view the consent form. One hundred forty-one completed the baseline measures. Participants ranged in age from 21–74 years ($M = 42.5$, $SD = 10.3$). Most were women (83%), and 23% were racial or ethnic minorities (6% Hispanic/Latino, 7% Black/African American, 7% Asian/Asian American, 2% American Indian/Alaska Native, 1% Hawaiian/Pacific Islander, and 4% other). Participants represented 40 different states; 15% of participants were from the West, 21% from the Midwest, 46% from the South, and 18% from the Northeast.

A majority (54%) reported that their formal education had consisted of no more than 2 years of college or technical school. Sixty-five percent reported that they were currently being treated for chronic pain, 86% reported they were currently using medications, and 55% reported currently taking an opioid. In terms of prior treatments for their pain, 78% reported that they had received opioids, 31% surgery, 28% injections (e.g., trigger point injections), 75% physical therapy, and 26% psychotherapy. Duration of chronic pain for the sample ranged from 6 to 516 months ($M = 103.7$, $SD = 94.1$). The sample mean average pain rating over the preceding week at baseline was 5.5 ($SD = 1.6$) on a 0 to 10 scale.

Procedure

All procedures were evaluated and approved by the Western Institutional Review Board. Participants completed all study measures online. Each participant logged in with a unique user ID so that no identifying information would be linked to their answers, and the data were stored on secure servers. A password-protected document linking participant names to user IDs was maintained by the study coordinator, but this was not accessible to individuals involved in analyzing outcome data.

Baseline (BL) assessment and randomization—Immediately after consenting, participants were able to begin completing baseline study measures. Upon completion of the

baseline measures, participants were randomized to the intervention (INT) group or to a wait-list control (WLC) group using a random number table. The INT group received immediate access to the WW. Participants were asked to finish the WW over the next 3 weeks by completing two chapters per week. Those who did not log in at least once per week were sent an email reminder by the research assistant. Those in the WLC group were informed that they would receive access to the WW in 3 weeks. Participants were paid \$35 for completing the baseline assessment.

Week 3 assessment—After 3 weeks, all participants were prompted to log into the study website to complete the study measures. A usability and satisfaction questionnaire was included for INT group participants. After completing this assessment, all participants were paid \$50 and participants in the WLC group were given access to the WW. Like INT participants, WLC participants were asked to finish the WW over the next 3 weeks by completing two chapters per week. After completing the Week 3 assessment, INT participants were allowed to continue using the workbook if they chose, but were not prompted to do so.

Workbook usage (pages visited, date/time, etc.) was recorded automatically and reviewed by the study coordinator. As this study was a preliminary evaluation of a new intervention, each participant was required to complete at least four out of the six chapters during the three-week time allotted.

Week 6 assessment—At Week 6, participants from both groups were asked to complete the study measures for the final time and paid \$50 for completing the assessment. A usability and satisfaction questionnaire was included for WLC group participants. After this assessment, a research assistant called to debrief each participant and conduct an exit interview to gather more information about his or her opinion of the WW.

Measures

The *Survey of Pain Attitudes* (SOPA)^{38–40} was our primary outcome measure. The SOPA-32 is a well-validated 32-item measure with seven subscales that measure strength of endorsement of pain-related beliefs, many of which present barriers to rehabilitative efforts: Control (belief that one can control one's pain), Disability (belief that one is disabled by one's pain), Harm-exercise (belief that one should avoid exercise), Emotion (belief that one's emotions affect one's experience of pain), Medication (belief that medications are appropriate for one's chronic pain), Solicitude (belief that others should care for one due to one's pain), Medical Cure (belief that a medical cure for one's pain is possible). Items are rated on 5-point Likert scales (0 = "very untrue for me," 4 = "very true for me"). The authors have demonstrated strong construct validity, internal consistency, and two-week test-retest reliability and shown that the SOPA predicts outcomes of pain management efforts and that improving dysfunctional beliefs improves pain management outcomes.^{14,41,42}

The *Fear Avoidance Beliefs Questionnaire* (FABQ)⁴³ is a reliable and valid 16-item instrument that assesses patients' beliefs regarding the effects of physical activity and work on their lower back pain with two subscales: effects of physical activity (e.g., "Physical activity makes my pain worse") and effects of work (e.g., "My work might harm my back") on their lower back pain. Items are rated on 7-point Likert scales (0 = "completely disagree" to 6 = "completely agree").

The *Negative Mood Regulation Scale*⁴⁴ is a 30-item inventory measuring the strength of beliefs that one can alleviate one's own negative moods (e.g., "When I'm upset, I believe that I can usually find a way to cheer myself up"). Each item is rated on a 5-point scale

(1=“strongly disagree”; 5= “strongly disagree”); higher scores reflect stronger self-efficacy for mood regulation.

The *Pain Catastrophizing Scale* (PCS)⁴⁵ is a 13 item measure that assesses catastrophic thinking and maladaptive responses to pain. Three subscales measure rumination, magnification, and helplessness. Patients indicate the degree to which they have each thought or feeling whenever they are experiencing pain on a 5-point Likert scale (0 = “not at all” to 4 = “all the time”), e.g., “When I’m in pain, I feel I can’t go on.”

The *Roland-Morris Disability Questionnaire*⁴⁶ is a widely used 24-item measure of pain-related physical disability. Each item, e.g., “I stay at home most of the time because of my pain,” is rated as a binary (0 = no, 1 = yes); higher score indicate more severe physical disability.

A *Pain Self-efficacy Scale* was adapted from the Arthritis Self-efficacy Scale developed by Lorig and colleagues.⁴⁷ Our 8-item adaptation assessed the extent of participants’ certainty that they could cope with their back pain, e.g. “How certain are that you can keep back pain from interfering with your sleep.” Items were rated on an 11-point Likert scale (0 = “very uncertain,” 10 = “very certain”). Turner et al⁴⁸ reported good psychometric properties for a similarly modified SES, which focused on pain instead of arthritis.

A *Demographics and Pain Assessment Questionnaire* administered at baseline included questions about participants’ age, gender, education, race, and ethnicity as well as questions about the duration of their chronic pain, whether they were currently being treated for chronic pain or were taking medications, and whether they had previously tried and received benefit from opioids). Participants rated their average, highest, and lowest level of pain over the preceding week (0= “No pain at all,” 10 = “Worst pain imaginable”). Pain levels were rated again at the Week 3 assessment.

After having access to the WW for 3 weeks (i.e., at the Week 3 assessment for the INT group and at the Week 6 assessment for the WLC group), participants completed a 15-item *Usability/Satisfaction Questionnaire*. Satisfaction items were rated on 7-point Likert scales (−3 = “strongly disagree” to 3 = “strongly agree”). In terms of self-reported usage, participants were asked, “On average, how many hours per week did you spend on the Wellness Workbook over the past 3 weeks, including practicing what you learned?” This item was rated on an 11-point Likert scale ranging from 1 = “Under 2” to 11 = “20 or more.” We also inspected server logs to obtain objective indices of participants’ extent of engagement in the WW.

Data Analytic Approach

Hypotheses—We hypothesized that, at the Week 3 assessment when the INT group had been exposed to the WW but the WLC group had not, the INT group would score significantly better than the WLC group on all dependent variables. We further hypothesized that, at the Week 6 assessment, after both groups had been exposed to the WW, there would be no differences between groups.

Baseline differences between groups—We examined whether randomization was successful in producing comparable groups in terms of demographics and baseline characteristics. Chi-square tests revealed no significant differences between the INT and WLC groups in terms of the proportions of women, racial/ethnic minorities, those completing more than 2 years of post-secondary education, those currently being treated for chronic pain, those currently taking medications, those who had tried opioids, and those whom opioids had helped. Independent-groups t-tests revealed no significant differences

between the INT and WLC groups in terms of age, average pain rating, or duration of chronic pain. With regard to the dependent variables, independent groups *t*-tests revealed no significant differences between the groups on any dependent variable, with the exception of the Emotion subscale of the SOPA, $t(139) = -2.15$, $p = .034$. Because the groups were slightly different at baseline, we elected to use multivariate analysis of covariance (MANCOVA) to test our hypotheses, controlling for baseline individual differences in the dependent measures.

Retention analyses—Next we examined whether those who completed the Week 3 assessment differed from those who did not in terms of demographics and baseline characteristics. Chi-square tests revealed no significant differences between Week 3 completers and non-completers with regard to racial/ethnic minority status, educational attainment, or chronic pain treatment, nor did they differ according to group assignment. Compared to completers, Week 3 non-completers were more likely to be men, $\chi^2(1) = 4.02$, $p = .045$, $N = 141$; less variable in age, Levene's $F = 4.04$, $p = .046$; older ($M = 47.7$ vs. 42.0), $t(13.2) = 2.60$, $p = .022$; and in lower average pain, $t(139) = -2.20$, $p = .029$. Independent groups *t*-tests revealed no significant differences between Week 3 completers and non-completers on any dependent variable.

Similar analyses were conducted to examine whether those who completed the Week 6 assessment differed from those who did not. Chi-square tests revealed that compared to completers, Week 6 non-completers were more likely to be in the WLC group (see Figure 1), $\chi^2(1) = 4.06$, $p = .044$, $N = 141$; racial/ethnic minorities, $\chi^2(1) = 13.29$, $p < .001$, $N = 138$. There were no other significant differences.

RESULTS

Usage data

Only 1% of participants reported using WW less than 2 hours per week; 59% reported using it at least 6 hours per week, and 28% at least 10 hours per week. From the server logs, for each participant we computed the number of unique pages visited, the number of days on which the WW was visited during the three week intervention period, and the number of chapters completed. Across conditions, 81% of participants completed all six chapters. Percent of participants completing each chapter ranged from 84% (Chapter 5) to 94% (Chapter 1). Sixty-five percent of participants in the INT group returned to the WW after the Week 3 assessment, i.e., after they had already completed the WW.

Multivariate analysis of variance was conducted to examine whether the conditions differed in their usage data. The dependent variables were the number of pages visited, the number of days on which the WW was visited (each page or day was only counted once), and the number of chapters completed. The omnibus multivariate main effect of condition was significant, $F(3, 131) = 2.96$, $p = .035$. Inspection of the univariate tests indicated that the effect was significant for number of days using the WW, $F(1, 135) = 8.14$, $p = .005$, such that, on average, the INT group ($M = 6.8$) used the WW on more days than the WLC group ($M = 5.2$). There was no difference between conditions in terms of number of unique pages visited or number of chapters completed. Across conditions, participants viewed an average of 153.9 ($SD = 48.0$) out of 189 pages and completed 5.3 ($SD = 1.7$) out of 6 chapters.

Hypothesis testing

To test our hypothesis that the INT group would score significantly better than the WLC group on all dependent variables at the Week 3 assessment, we conducted a single MANCOVA to limit Type I error inflation. The dependent variables were the Week 3

follow-up pain severity ratings and scores on all of the subscales from all of the study measures, controlling for baseline individual differences in those variables. The multivariate main effect of group assignment was significant, $F(18, 109) = 4.88, p < .001$. As shown in Table 1, follow-up univariate F tests indicated that the effect was significant for all measures, except the Medical Cure subscale of the SOPA, the Work subscale of the FABQ, and the pain severity ratings.

To test our hypothesis that there would be no differences between groups at the Week 6 assessment, we conducted a second MANCOVA. The dependent variables were the Week 6 follow-up scores on all of the subscales from all of the study measures, controlling for baseline individual differences in those variables. The multivariate main effect of group assignment was not significant, $F(15, 101) = 0.55, p = .909$, indicating that the groups were functionally equivalent at Week 6 follow-up.

Post-hoc tests

To examine within-group change across time, we conducted post-hoc paired t-tests within groups on the first 15 outcomes listed in Table 1 (i.e., all outcomes but the pain severity ratings, which were not assessed at Week 6). Bonferroni correction for 15 tests yields an alpha of .003, which was used to determine statistical significance and limit Type I error inflation. Within the INT group, we compared baseline scores to Week 3 scores. Significant improvement ($ps < .003$) was noted for all outcomes except the Solicitude ($p = .085$) and Medical Cure ($p = .322$) subscales of the SOPA and the Work subscale of the FABQ ($p = .032$). Within the WLC group, we compared Week 3 scores to Week 6 scores. Similarly, significant improvement was noted for all outcomes except the Medical Cure subscale of the SOPA ($p = .100$) and the Work subscale of the FABQ ($p = .004$).

Usability and satisfaction

Table 2 shows the means for the items from the Usability/Satisfaction Questionnaire. In general, the WW appears to have been well regarded.

DISCUSSION

This paper reports findings from a randomized, waitlist-controlled trial evaluating the efficacy of a pilot version of a web-based CBT self-help intervention for individuals with chronic lower back pain, the Wellness Workbook (WW). In summary, results suggest that the WW had significant positive effects on participants' ability to conceptualize, self-manage, and react to their pain. Participants used the six-chapter WW for 3 weeks. At Week 3, the intervention group (as compared to the waitlist control group) endorsed stronger belief that they could control their pain and they less strongly believed that they were disabled by pain, that they should avoid exercise, and that medications were the best treatment. Furthermore, the intervention group showed improvement in self-efficacy for pain management and mood regulation as well as decreased pain catastrophizing and fearful avoidance of physical activity. No significant changes were noted with regard to pain severity. At six weeks (when both groups had used the WW), between group differences disappeared, with both groups showing improvements on cognitive and attitude measures as compared to pre-test.

These results suggest that participating in a brief web-based, self-help intervention can effectively alter individuals' pain-related beliefs and attitudes and may improve functioning. These findings add to the growing body of literature demonstrating the effectiveness of self-help or self-management interventions on chronic pain and related outcomes. While the present study focused on persons living with chronic lower back pain, other studies have

demonstrated similar results for self-help interventions involving other chronic pain populations.²⁵ The evidence is perhaps strongest for the treatment of headache, with home-based, self-help interventions resulting in comparable or superior outcomes to clinic-based treatments.³¹ Furthermore, web-based self-help interventions have been shown to have notable benefits with a variety of patient populations with pain.^{49–52} In fact, effect sizes from a 2004 meta-analysis comparing web-based vs. non-web-based interventions showed an increase in knowledge and positive behavior change among chronically ill participants who used web-based approaches.⁵³

While there is still much work to be done with regard to the development of comprehensive, web-based programs for chronic back pain, the above findings offer a promising glimpse of future treatment approaches. In several ways self-help interventions delivered via the internet may be ideal for persons living with chronic lower back pain. First, although multidisciplinary treatment for chronic pain (which includes non-pharmacological treatment) is now considered the “gold standard” by numerous healthcare organizations, many people may find seeing a psychologist or mental health practitioner stigmatizing. Hence, participating in treatment online from the privacy of one’s own home may be especially appealing. Second, comprehensive or multidisciplinary pain treatment programs may not be accessible for a substantial number of patients, as they tend to be located in large, urban areas and require a high level of commitment (such as daily attendance for several weeks). They are also expensive, and may not be covered by insurance companies. However, these barriers are either absent or minimized with web-based interventions, particularly as the number of persons with Internet access continues to rise.⁵⁴

It is somewhat surprising to find the magnitude of change reported here when the brief intervention period is considered. Although participants used the intervention for only three weeks, we found changes on most cognitive measures and on disability ratings with medium to large effect sizes. Change often occurs early in cognitive behavioral therapy before patients have an opportunity to learn and practice the skills that are the putative mechanisms of change.⁵⁵ This rapid change is perhaps due to the acceptance of an internally consistent and meaningful treatment rationale. Indeed, we postulate that introducing a mind/body treatment rationale, thus encouraging patients to try new ways to manage their own pain is empowering and enhances self-efficacy.²⁴ Because seeking external causes/treatments for pain can be common in, and problematic for, persons with CLBP, an intervention that enhances self-efficacy is of particular relevance. Furthermore, Buenaver, McGuire, and Haythornthwaite²⁵ have posited this increase in self-efficacy mediates the relationship between self-help interventions and subsequent reductions in pain and disability and that these changes can be maintained over long periods of time. Future research should certainly examine the mechanisms of change in Internet-based self-help CBT interventions as they may differ from traditional face-to-face treatments.

The intervention and wait-list control group had somewhat different patterns of use of the workbook. When comparing the three week initial intervention period for both groups, the intervention group participants, who had immediate access to the workbook, used it more days and viewed more pages overall than the waitlist control group. It is unclear why that might be. Perhaps the waitlist control group lost interest in the study during the waiting period. The workbook, however, was effective for both groups.

Although the results from the present study are promising, the study had several limitations. First, one primary goal of the study was to hear from actual patients what they liked and disliked about the intervention. Therefore, we strongly encouraged all participants to complete at least two thirds of the intervention. Participants who did not complete the required amount of the intervention were considered study dropouts and were not offered the

second and third assessment or follow-up interview. In retrospect, we lost valuable data about why participants might drop out of this type of treatment. There was also differential attrition between the two groups: more participants in the wait-list group dropped out of the study, both between weeks one and three and between weeks three and six. It is possible that those who dropped out were less likely to have benefitted from the workbook, thus making the comparisons between groups at week six less compelling. An intent-to-treat methodology would have allowed us to investigate the reasons for drop out. Attrition also differed by gender with more men leaving the study than women. There were also more female participants in the initial sample, leading to a study sample primarily comprised of women. We can only speculate about why this occurred. Women tend to seek help more often than men, in general, and the nature of the intervention may have been more appealing to women (e.g., emphasis on acceptance and relaxation training rather than problem-solving). Unfortunately, the gender imbalance may further limit the generalizability of the results.

Little remains known regarding who benefits most from self-help treatments,²⁵ and the present study did not shed any new light on the issue. Presumably, to be successful, patients need sufficient motivation to make the time to use the materials on their own and sufficient receptiveness to the mind/body treatment rationale. Similarly, little is known about who benefits more from Internet-based therapies. For example, age may be a factor in willingness to engage in online interventions. Our initial sample was primarily made up of individuals in their twenties and thirties. In an attempt to recruit a sample more representative of the chronic pain population in general, we changed the inclusion criteria to include only individuals over forty for the remainder of the recruitment period. Older individuals were more likely to drop out of the study between weeks one and three, perhaps indicating that the online format may be more acceptable to younger people who have grown up with computers. Younger individuals may be more comfortable using technology enhanced interventions and may be more easily engaged in online activities. Finally, a wait-list control group does not control for non-specific effects of treatment as it is comparing the online treatment to no treatment. An active control condition is needed to determine that the specifics of the treatment are what caused the effects. Future research should evaluate the relative effectiveness of online self-help with other, popular and inexpensive self-help methods, such as self-help books.

In summary, this study demonstrated the potential efficacy of a web-based, self-help intervention to change maladaptive pain-related thoughts and beliefs in a self-identified CLBP population. As the Internet increasingly becomes a major source of medical information for individuals, this study demonstrates that it can also be an efficient and effective tool for delivering evidence-based interventions. As the health care system becomes more complex and health care costs continue to rise, a low-cost, self-paced intervention such as the Wellness Workbook holds great promise in reaching those who might normally have difficulty accessing state-of-the-art biopsychosocial interventions for CLBP.

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Figure 1. Participant retention flow diagram. In parentheses are the numbers of participants passing each milestone. Abbreviations: CBT, cognitive-behavioral therapy; INT, immediate intervention group; WLC, waitlist control group; WW, Wellness Workbook; Q, questionnaires.

Group Means on the Outcome Variables at the Baseline, Week 3, and Week 6 Assessments and Results of the Between-Groups Comparison at Week 3.

Table 1

		Baseline		Week 3		Week 6		<i>F</i> (1, 126) ^a	<i>p</i> ^b	<i>d</i> ^c
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
1. SOPA -Control	INT	2.1	0.7	2.9	0.6	3.0	0.7	44.65	< .001	1.01
	WLC	2.0	0.8	2.1	0.8	2.9	0.7			
2. SOPA -Disability	INT	2.5	0.9	2.1	0.9	2.0	0.8	19.48	< .001	-0.72
	WLC	2.6	0.9	2.7	0.8	2.2	0.8			
3. SOPA -Harm-Exercise	INT	1.6	0.8	1.1	0.7	1.1	0.8	24.48	< .001	-0.80
	WLC	1.7	0.9	1.7	1.0	1.1	0.9			
4. SOPA -Emotion	INT	2.6	0.9	3.2	0.7	3.2	0.7	26.51	< .001	0.82
	WLC	2.9	0.8	3.0	0.8	3.4	0.6			
5. SOPA -Medication	INT	2.5	0.9	1.9	1.0	2.0	1.0	28.24	< .001	-0.88
	WLC	2.6	0.9	2.7	0.9	2.1	1.0			
6. SOPA -Solicitude	INT	2.2	0.9	2.0	0.9	1.9	1.0	5.09	.026	-0.39
	WLC	2.3	0.9	2.4	0.9	2.0	1.0			
7. SOPA -Medical Cure	INT	1.6	0.9	1.5	0.9	1.5	0.9	1.93	.167	-0.25
	WLC	1.8	1.0	1.8	0.8	1.6	0.8			
8. Roland-Morris Disability	INT	16.3	5.3	13.5	5.8	11.9	5.9	6.65	.011	-0.45
	WLC	17.1	4.7	16.3	5.2	12.9	6.9			
9. Self-Efficacy	INT	4.9	2.0	7.0	1.8	7.0	1.7	33.97	< .001	0.89
	WLC	4.8	2.2	5.0	2.3	6.8	2.0			
10. FABQ -Physical Activity	INT	3.7	1.2	2.7	1.5	2.6	1.4	25.14	< .001	-0.80
	WLC	3.7	1.3	3.8	1.4	2.8	1.5			
11. FABQ -Work	INT	2.5	1.7	2.2	1.6	2.1	1.6	3.22	.075	-0.30
	WLC	2.9	1.6	2.8	1.6	2.3	1.8			
12. PCS -Rumination	INT	2.1	1.0	1.6	1.0	1.4	1.0	11.30	< .001	-0.59
	WLC	2.3	1.1	2.2	1.0	1.5	1.1			
13. PCS -Magnification	INT	1.8	1.0	1.3	0.9	1.0	0.8	12.61	< .001	-0.63
	WLC	1.8	1.0	1.8	1.0	1.1	1.1			

		Baseline		Week 3		Week 6		<i>F</i> (1, 126) ^a	<i>p</i> ^b	<i>d</i> ^c
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
14. PCS -Helplessness	INT	1.6	0.9	1.0	0.8	0.9	0.7	21.06	<.001	-0.77
	WLC	1.8	1.0	1.6	0.9	1.1	1.0			
15. Negative Mood Regulation	INT	3.5	0.5	3.9	0.6	3.9	0.6	17.31	<.001	0.70
	WLC	3.4	0.6	3.5	0.6	3.8	0.5			
16. Pain Rating -Average Pain	INT	5.2	1.5	5.2	1.5	—	—	0.44	.507	-0.19
	WLC	5.7	1.7	5.7	1.7	—	—			
17. Pain Rating -Lowest Pain	INT	3.1	1.8	3.3	1.9	—	—	0.36	.549	-0.14
	WLC	3.7	2.0	4.0	2.0	—	—			
18. Pain Rating -Highest Pain	INT	7.2	1.6	7.0	1.8	—	—	0.08	.784	-0.12
	WLC	7.4	1.6	7.3	1.6	—	—			

Abbreviations: INT, Intervention Group; WLC, Waitlist Control Group; SOPA, Survey of Pain Attitudes; FABQ, Fear Avoidance Beliefs Questionnaire; PCS, Pain Catastrophizing Scale.

^a *F*-statistics are reported from univariate tests conducted in conjunction with multivariate analysis of covariance in which the between-subjects effect of group is evaluated on the Week 3 outcomes, controlling for individual differences at baseline.

^b *p*-values correspond to the univariate *F*-statistics in the column to the left.

^c Cohen's *d*s correspond to the effect sizes for the between-group effect at the Week 3 assessment, controlling for baseline scores.

Table 2

Means for Items from the Usability/Satisfaction Questionnaire (N = 116)

	<i>M^a</i>	<i>SD</i>
I found the software easy to use.	2.5	1.1
It was difficult to navigate and get around in the program.	-2.2	1.6
The situations and characters presented were realistic.	2.1	1.4
The narration was a helpful part of the program.	2.2	1.5
I found the workbook attractive to look at.	2.1	1.0
I enjoyed using the software.	2.2	1.1
I learned new ways to cope with my pain.	2.4	1.0
I will try to use at least one of the techniques I learned to manage my pain in the future.	2.6	0.9
I liked the relaxation exercises and guided meditations.	2.3	1.2
I felt like this workbook was developed for someone like me.	2.2	1.2
I think the information presented in the workbook was trustworthy.	2.6	0.9
I found the exercises annoying, repetitive, or unhelpful.	-1.4	1.9
I would recommend this tutorial to a friend who has back pain.	2.5	1.1

^a Each item was rated from -3 = "strongly disagree" to 3 = "strongly agree."