Published in final edited form as:
Int J Clin Exp Hypn. 2009 April ; 57(2): 198–221. doi:10.1080/00207140802665476.

A Comparison of Self-Hypnosis Versus Progressive Muscle Relaxation in Patients With Multiple Sclerosis and Chronic Pain[1]

Mark P. Jensen, **Joseph Barber**, **Joan M. Romano**, **Ivan R. Molton**, **Katherine A. Raichle**, **Travis L. Osborne**, **Joyce M. Engel**, **Brenda L. Stoelb**, **George H. Kraft**, and **David R. Patterson**[2]
University of Washington School of Medicine, Seattle, Washington, USA

Abstract

Twenty-two patients with multiple sclerosis (MS) and chronic pain we recruited into a quasi-experimental trial comparing the effects of self-hypnosis training (HYP) with progressive muscle relaxation (PMR) on pain intensity and pain interference; 8 received HYP and the remaining 14 participants were randomly assigned to receive either HYP or PMR. HYP-condition participants reported significantly greater pre- to postsession as well as pre- to posttreatment decreases in pain and pain interference than PMR-condition participants, and gains were maintained at 3-month follow-up. Most of the participants in both conditions reported that they continued to use the skills they learned in treatment and experienced pain relief when they did so. General hypnotizability was not significantly related to treatment outcome, but treatment-outcome expectancy assessed before and after the first session was. The results support the efficacy of self-hypnosis training for the management of chronic pain in persons with MS.

Pain is a common and significant problem in many persons with multiple sclerosis (MS). Although the reported rates of pain problems in samples of individuals with MS vary across studies, most surveys report prevalence rates between 40% and 80% (Archibald, McGrath, Ritvo, & Fisk, 1994; Beiske, Pedersen, Czujko, & Myhr, 2004; Ehde et al., 2003; Ehde, Osborne, & Jensen, 2005; Goodin, 1999; Hadjimichael, Kerns, Rizzo, Cutter, & Vollmer, 2007; Indaco, Iachetta, Nappi, Socci, & Carrieri, 1994; Rae-Grant, Eckert, Bartz, & Reed, 1999; Solaro et al., 2004; Stenager, Knudsen, & Jensen, 1991, 1995; Svendsen et al., 2003; see also review by O'Connor, Schwid, Herrmann, Markman, & Dworkin, 2008). The presence and severity of pain in persons with MS has also been shown to be associated with higher levels of depression, functional impairment, and fatigue (O'Connor et al.). Despite the frequency and negative impact of pain in persons with MS, however, there are few controlled trials examining

[1]This research was supported by grants number R01 HD42838 and R01 AR054115 from the National Institutes of Health; grant number H133B031129 from the Department of Education, National Center of Disability and Rehabilitation Research, and the Hughes M. and Katherine G. Blake Endowed Professorship in Health Psychology awarded to MPJ. A portion of this work was conducted through the Clinical Research Center Facility at the University of Washington and supported by the National Institutes of Health, Grant M01-RR-00037. The authors gratefully acknowledge the assistance of Amy Hoffman, Kevin Gertz, Eric Weitz, and Joe Skala in participant recruitment, data collection, and data entry.

2Address correspondence to Mark P. Jensen, Department of Rehabilitation Medicine, Box 356490, University of Washington School of Medicine, Seattle, WA, 98195-6490, USA. E-mail: mjensen@u.washington.edu.

the efficacy of treatments for MS-related pain, severely limiting our ability to make empirically based treatment recommendations for individuals with MS and chronic pain.

Preliminary evidence suggests that self-hypnosis training could potentially benefit persons with MS and chronic pain, supporting the need for controlled trials to examine this approach. Literature reviews, for example, have concluded that hypnosis can be effective for a variety of acute and chronic pain conditions (see Jensen & Patterson, 2006; Montgomery, DuHamel, & Redd, 2000; Patterson & Jensen, 2003), although there are yet to be any published controlled trials studying pain in persons with MS, specifically. In addition, three uncontrolled case reports and case series have reported benefits following hypnotic treatment in patients with MS and chronic pain. In the first of these, Dane (1996) described a patient with MS who was able to maintain stable pain control and some neuromuscular rehabilitation gains for 3 months after hypnotic treatment that also included regular self-hypnosis practice. Similarly, Sutcher (1997) reported benefits from hypnotic treatment in 3 patients with MS, 1 who received treatment specifically targeting pain. More recently, our group reported pretreatment to posttreatment improvements in daily pain intensity among 33 individuals with chronic pain and disabilities, 10 of whom had MS (Jensen et al., 2005). Moreover, a large proportion of the individuals who benefit from self-hypnosis training maintain that benefit for up to 12 months after treatment (Jensen et al., 2008).

Despite these promising findings, there is much that is not known about the effects of self-hypnosis training on pain and other outcome variables in persons with MS. First, as indicated above, no controlled trials examining the efficacy of self-hypnosis training in persons with MS have been published. Such trials are necessary to determine if self-hypnosis training has any specific effects on chronic pain beyond the effects of placebo (expectancy), time, or therapist attention (Jensen & Patterson, 2005). Also, although pain intensity is commonly assessed as the primary outcome variable in hypnotic analgesia studies, with the exception of a very few studies (cf. James, Large, & Beale, 1989; Jensen et al., 2005, 2008), other outcome domains, such as the impact of pain on functioning, are rarely assessed in hypnotic-analgesia research. Thus, little is known about the effects of self-hypnosis training on other key outcome variables.

Finally, more needs to be understood about the predictors of hypnotic treatments, both to help test and to refine theories of hypnosis as well as to make practical recommendations to patients and clinicians for better predicting and enhancing the effects of treatment. For example, social-cognitive models of hypnosis contend that patient treatment outcome expectancies play an important role in determining response to hypnosis and hypnotic suggestions, and a number of laboratory studies support this model (see review by Kirsch, 1985). Examining the hypothesized associations between patient outcome expectancies and treatment outcome would help to test the viability of this model in the clinical setting. General hypnotizability has also been found to predict treatment outcome in some, but not all, clinical hypnotic-analgesia studies (see review by Patterson & Jensen, 2003). To the extent that general hypnotizability is found to be associated with treatment outcome, it would support the utility of hypnotizability measures for screening patients for treatment, or at least for modifying treatment to match different levels of hypnotizability.

With these considerations in mind, the current study sought to expand our understanding of the effects of self-hypnosis treatment for chronic pain relative to a control condition. We used an active control treatment, progressive muscle relaxation (PMR), because it controls for therapist attention, time, and patient outcome expectancy, three key nonspecific factors that could potentially explain the effects of self-hypnosis treatment. We hypothesized that if the self-hypnosis treatment protocol produces benefits beyond those produced by these nonspecific factors, then participants in the hypnosis condition would report more treatment benefits than those assigned to the PMR condition. A treatment-outcome study such as this also makes it

possible to explore potential predictors of outcome, and we therefore assessed and examined the effects of two such predictors, hypnotizability and participant-reported treatment-outcome expectancy, to determine their association with treatment outcome.

METHOD

Participants

Twenty-two individuals with MS and chronic pain were recruited from a previously completed survey study of pain in persons with MS (Ehde, Osborne, Hanley, Jensen, & Kraft, 2006). Patients were eligible to participate in the current study if they: (a) had a diagnosis of MS; (b) were at least 18 years old; (c) reported chronic daily pain that was rated as being at least 4/10, on average, on a 0–10 Numerical Rating Scale of intensity; and (d) indicated on the survey that they would be willing to be contacted about possible participation in future research studies. Exclusion criteria were (a) evidence of severe psychopathology symptoms of psychosis on interview or endorsement of active suicidal ideation with intent within the past 6 months (two potential participants were excluded on this basis); and (b) a score of 21 or greater on the Telephone Interview of Cognitive Status (Brandt, Spencer, & Folstein, 1988), indicative of severe cognitive deficits that could potentially interfere with the focused attention required for hypnosis (no potential participants were excluded for this reason).

The first 8 eligible participants who agreed to participate in this study were given a standardized self-hypnosis training protocol (HYP), with an initial plan that these participants would be pilot subjects and allow for additional changes in the protocol as needed. These 8 participants were all told that they would be receiving an intervention that had "both hypnotic and relaxation components" that had been shown to be associated with reductions in pain in previous research. However, we determined that no changes in the HYP protocol would be needed based on the use of the protocol with these participants, allowing us to potentially include them in analyses of other HYP participants if (a) no significant differences were found in outcome between these participants and those subsequently randomly assigned and (b) additional participants were needed to provide for adequate power in the planned analyses if recruitment for the planned randomized trial was limited. The next 14 eligible study participants were randomly assigned (via a computer-generated list of random numbers) to one of the two treatment conditions (n = 7 per condition). For these participants, although they knew that they would be randomized to one of two possible treatments, both the HYP and the PMR interventions were described to the participants in the same way. In all, there were 15 participants in the HYP condition and 7 in the PMR condition.

We determined that 7 participants per condition in the randomized portion of this study would be inadequate for testing hypothesized differences between the HYP and PMR treatments, so the outcomes between the 8 participants who were given HYP (without randomization) and the 7 participants who were randomized to HYP were compared on all demographic and outcome variables. No significant differences between these two groups emerged on any variable, justifying combining the two into a single group for subsequent analyses; although including these nonrandomized participants makes the design a quasi-experimental study rather than a randomized clinical trial (Cook & Campbell, 1979).

The mean age of the study participants was 51.7 years (range = 27– 75 years). Most (73%) were women, and 20 (91%) were Caucasian. One participant described himself as an African American, and a second described himself as being both Caucasian and African American. Pre-and posttreatment data were collected from all 22 participants, but 2 of the participants (1 from each treatment condition) did not provide data for the secondary outcome variable (pain interference) at the 3-month follow-up assessment. Therefore, all analyses using the 3-month pain-interference scores had 20 participants.

Intervention Protocols

Both treatment protocols were initially described to the study participants using the same wording to increase the probability that participants would develop similar outcome expectancies for both treatments. Specifically, both interventions were described in the following way: “Treatments that have been shown to produce decreases in pain in individuals with a variety of chronic pain conditions and that included both relaxation and hypnosis components.” Participants were also told that the focus of the interventions was to teach a specific set of skills that could be used to alter how their brain processes pain information and that provide pain relief when they chose to use the skills in the future. They were told that the purpose of the study was to determine if these treatments would be helpful for persons with MS and chronic pain, and also to help us determine if one treatment was more or less effective than the other. In all communication with the study participants, both treatments were referred to as “relaxation and hypnosis” training programs; we specifically avoided labeling one as *Hypnosis* and the other as *Relaxation* or *Progressive Muscle Relaxation*, again, to minimize differences in expectancy between the two treatment conditions that might occur if they were given different labels.

Self-hypnosis training—We refer to the intervention we used in this study *self-hypnosis training* rather than *hypnosis treatment* because of the focus on teaching and encouraging the use of hypnosis outside of the hypnosis sessions. Thus, although the HYP intervention included hypnosis (interactions with a clinician that included an induction followed by a series of suggestions for analgesia and comfort), participants were urged to practice the skills learned during the hypnosis sessions at home, both by listening to audio recordings of the sessions and by using a cue to reexperience hypnosis and the relief that it provides.

The self-hypnosis training (HYP) treatment protocol was a modified version of a treatment protocol described in detail in a previous case series study (Jensen et al., 2005). The modifications to the original protocol were made in an effort to increase the efficacy of the intervention beyond what was found in the previously reported case series. The first modification was the inclusion of a suggestion inviting participants to imagine themselves as being in a “special place” of the participant’s choice. For participants who were comfortable with it, the special place could include a body of water of the participant’s choice (e.g., pool, stream, or ocean) that was “just the right temperature” and that the participant could choose to relax or float in (any participant who was water-phobic or otherwise uncomfortable with the idea of relaxing in a body of water could have opted out of this suggestion; although no one chose to do so). Those who would have been water phobic were encouraged to visualize being in another place of their choosing without water (e.g., a field of flowers, a vacation home, etc.). Second, the induction and special place imagery were followed by a suggestion for experiencing one classic hypnotic phenomenon (such as hand or arm lowering, hands pulled together, head pulled to the side; different phenomenon were tried until one was found that the participant could respond to) to enhance the participant’s sense of successful hypnotic responding.

A third modification came in the number and content of analgesia suggestions. In the original treatment protocol (Jensen et al., 2005), five analgesia suggestions (decreased pain unpleasantness, deep relaxation, sensory substitution, imagined anesthesia, and decreased pain sensations; see Jensen et al., 2005, for a detailed description of these suggestions) were included in all 10 sessions. In the present study, these five suggestions were administered *only* in the first two sessions. In the remaining eight sessions, only two specific suggestions were used. The first was the suggestion for decreased unpleasantness of any uncomfortable sensations, which we have found to be helpful to the majority of individuals with chronic pain. The second suggestion was selected by the clinician, usually based on the individual participant’s response

(i.e., a reported decrease in pain). But other factors were also taken into account, especially when participants reported similar decreases in pain following more than one additional suggestion, such as (a) if the participant reported that he or she particularly enjoyed a suggestion or (b) if the participant reported benefits to a suggestion in addition to changes in pain. This modification was made primarily because a number of participants in the original case series had indicated that they preferred some suggestions over others, and we wanted to allow some flexibility and tailoring in the treatment approach to better match usual clinical practice. The final modification made was that the new protocol allowed for one additional suggestion of the participant's choosing (e.g., improved sleep, increased general calm or sense of well-being) to further engage the participant in the process.

As with the original protocol, all sessions ended with posthypnotic suggestions that (a) any experience of analgesia and comfort obtained would stay with the participant and linger beyond the sessions, lasting for "hours, days, and even weeks," and become "a permanent part of how the brain operates"; (b) the more the participant listens to recordings of the sessions, and to the extent that the participants finds the suggestions helpful, the more effective all of the suggestions would be; and (c) over time and with continued practice, the participant will be able to enter "a comfortable relaxed state of hypnosis more and more easily." Sessions 3 and 4 were recorded, and audiotapes or CDs of these sessions were given to the participants to listen to, with the suggestion that they listen to the recordings at least once every day but more often if they found the recordings helpful. Participants were also encouraged to repeat their experience of hypnosis and any suggestions that they found helpful "on your own" (i.e., without the audio recording) at least once every day, as a way to increase their ability to use and respond to self-hypnosis.

Progressive muscle relaxation—The 10-session progressive muscle relaxation (PMR) intervention was based on the work of Bernstein and Borkovec (1973) and Jacobson (1976) and involved a progressive tightening and relaxing of different muscle groups throughout the body, with ongoing suggestions that this would be associated with an increased sense of perceived relaxation and comfort. Four different scripts were used for the PMR condition. The first script, used in the first two sessions, focused on 16 major muscle groups: right and left hands, right and left arms, forehead, face, jaw, neck, chest/shoulders/ upper back, abdomen, right and left thigh, right and left calf (plantar flexion), right and left shin (dorsi flexion). The second script, used for Sessions 3 through 5, combined some of the muscle groups together, so that seven general muscle group areas were the focus of relaxation. The third script combined muscle groups further into four overall, and the fourth and final script focused only on general body scanning and relaxation. Sessions 3 and 4 were recorded, and audiotapes or CDs of these were provided to participants with the same instructions as those given to participants in the HYP condition (i.e., to listen to the recordings at least once a day but more often if they found the recordings helpful). Participants in the PMR condition were also encouraged to practice on their own without the recordings at least once per day.

Measures

Primary outcome—The primary outcome variable for this study was pain intensity, assessed using 0–10 numerical rating scales (NRSs), with 0 = *No pain sensation* and 10 = *The most intense pain sensation imaginable*. Self-report of pain intensity is recognized as the most appropriate primary outcome measure in analgesic clinical trials (Turk et al., 2003), and the 0–10 NRS has been recommended as a useful measure of this pain domain because of (a) the strong evidence for its validity as evidenced by its strong association with other measures of pain intensity and responsivity to analgesic treatment, (b) understandability and ease of use, and (c) ease of administration and scoring (Jensen & Karoly, 2001).

Current pain-intensity ratings were obtained before and after each treatment session by the treating clinician, and each of these ratings was then averaged into composite pre- and postsession scores, to measure the immediate effects of the interventions on pain intensity. Average daily pain intensity was assessed by phone interview by a research assistant blind to treatment condition, before and after treatment as well as at 3-months follow-up. To assess this outcome variable, participants were telephoned on 4 days within a 7-day window and asked to rate their current pain and average, least, and worst pain in the past 24 hours. The 16 ratings obtained at each assessment (four intensity domains assessed on 4 different days each) were then averaged into a composite score representing average daily pain. The use of such composite scores has been recommended as a way to increase measurement reliability in pain clinical trials, such as this one, with limited power due to low sample sizes (cf. Jensen, Turner, Romano, & Fisher, 1999). If a participant could not be contacted four times within a 7-day period, the composite score was made up of an average of the ratings that could be obtained during the assessment window.

Secondary outcomes—The secondary outcome variables in this study were pain interference and frequency and effects of self-hypnosis and relaxation practice. Pain interference was assessed using a modified version of the Pain Interference Scale from the Brief Pain Inventory (BPI; Cleeland & Ryan, 1994; Daut, Cleeland, & Flannery, 1983). The original version of this scale asks respondents to rate the degree to which pain interferes with seven daily activities, including general activity, mood, walking ability, normal work, relations with other people, sleep, and enjoyment of life. For use in the current study, we modified the BPI in two ways. First, we changed Item 3 (“Walking ability”) to read “Mobility, that is, your ability to get around,” to be more appropriate for the participants in the current study, many of whom are unable to walk. Second, in order to gain a broader perspective of the extent to which pain interfered with important activities, the current study added three items (self-care, recreational activities, and social activities) important to functioning in persons with disabilities, to both (a) increase the reliability of measurement and (b) increase the content validity of this measure. The BPI interference items are averaged to produce a total composite pain interference score.

The original BPI Pain Interference scale has demonstrated validity through its strong association to pain severity across a number of samples of individuals with cancer and other diseases (Daut et al., 1983; see also Cleeland & Ryan, 1994), and the modified 10-item version of this scale has demonstrated validity in samples of persons with disabilities, including persons with MS, through its strong association with pain intensity, and even stronger association with measures of physical disability (Osborne, Ehde, Jensen, & Kraft, 2006; Tyler, Jensen, Engel, & Schwartz, 2002). The modified BPI was administered once, by telephone, during each assessment window.

Amount and effects of self-hypnosis and relaxation practice after treatment were assessed via telephone interview by a research assistant blind to treatment condition at 1-, 2-, and 3-months posttreatment by asking participants to indicate, during the past 30 days: (a) the number of days they listened to the audio recording they were given; (b) on those days they listened to the audio recording, the usual number of times they listened; (c) the amount of pain relief they experienced when they listened to the audio recording (on a 0–10 scale, with 0 = *No relief* and 10 = *Complete relief*); and (d) the hours of relief they usually experienced after listening to the recording. Similar questions were also asked about the frequency and effects of practice on their own, without the recordings.

Predictors/manipulation check—Two predictor variables were assessed in this study: hypnotizability and treatment-outcome expectancy. Hypnotizability was assessed using a modified version of the Stanford Hypnotic Clinical Scale (SHCS; Hilgard & Hilgard, 1994)

and was administered by one of the study clinicians (but not the same clinician who provided treatment) at the time of study recruitment. The SHCS, which has demonstrated its validity through its positive association with other measures of hypnotizability (Hilgard & Hilgard), consists of five suggestions for classic hypnotic responses, including hand lowering, suggested cough/throat clearing, amnesia, age regression, and a hypnotic dream. The hand-lowering item was modified to allow for an alternative motor response (e.g., moving the head to the right) for any participants with motor limitations in their arms.

Treatment-outcome expectancy was assessed using the four-item Treatment Expectancy Scale (TES; Holt & Heimberg, 1990) with the items modified to assess expectancies concerning the effects of treatment on pain. Using this measure, participants were asked to rate: (a) the perceived logic of the treatment ("How logical does this type of treatment seem to you?"); (b) their confidence in the treatment for their pain condition (two questions: "How confident would you be that this treatment will be successful in eliminating your pain?" and "How successful do you feel this treatment will be in decreasing your pain?"); and (c) their confidence in the treatment for others ("How confident would you be in recommending this treatment to a friend who was experiencing a great deal of pain?"). The participants were asked to respond to each item on 0-to-10 numerical scales just before and after the first treatment session, and their responses to the items were averaged to form two (pre- and postsession) measures of treatment-outcome expectancy. The original TES has been used successfully in treatment-outcome research to determine the credibility of control conditions (e.g., Heimberg, Dodge, Hope, Kennedy, & Zollo, 1990) and to determine the extent to which treatment-outcome expectancies predict treatment response (Chambless, Tran, & Glass, 1997; Safren, 1997). The modified TES used in this study was also used previously to predict response to a hypnotic analgesia intervention, specifically (Jensen et al., 2005). In this study, treatment-outcome expectancy was used both as a predictor variable (to determine the ability of outcome expectancies to predict treatment outcome) and as a manipulation check (to ensure that the two treatment conditions elicited similar outcome expectancies).

Procedures

Following 1 week of pretreatment assessments (to assess average daily pain and pain interference), participants received up to 10 sessions of either HYP or PMR (randomization procedure described above). Current pain intensity was assessed before and after each treatment session, and these ratings were averaged into composite pre- and post-session intensity scores. Posttreatment outcome measures (daily pain intensity and pain interference) were obtained during the 7 days immediately after treatment; amount of hypnosis or relaxation practice with and without the practice recordings was assessed at 1-, 2- and 3-months posttreatment, and daily pain intensity and pain-interference data were obtained during a 1-week period 3 months after treatment.

Data analyses—Differences in treatment-outcome expectancy assessed before and just after the first session were first compared between participants in the two treatment conditions using mixed-design analysis of variance (ANOVA), and subsequent univariate tests as appropriate to explain any significant effects found. A mixed-design ANOVA was also used to determine the immediate effects of each treatment condition on pain intensity. In these analyses, the pre- and postsession pain intensity scores averaged across all sessions were used as the dependent variable, time (presession, postsession) as a repeated measures variable, and treatment condition (HYP, PMR) as a between-subjects variable.

The effects of treatment on daily pain intensity and interference were evaluated by performing two mixed-design ANOVAs. In these analyses, the daily pain intensity composite and BPI interference scores were the dependent variables, time (pretreatment, posttreatment, and 3-

month follow-up) was the repeated-measures variable, and treatment condition was the between-subjects variable. Any significant effects or trends were followed up with univariate analyses (paired *t* tests) to help explain the effects found.

Given the fact that findings concerning average change in pain intensity do not provide information about the rates of positive response among individuals in the sample (a moderate degree of change in average pain for the sample as a whole could be obtained, for example, from a small to medium treatment response in all participants or from a large response in a very few participants), a responder analysis was conducted to determine the number of participants who showed a clinically meaningful change in pain intensity from pre- to postsession as well as from pretreatment to posttreatment and follow-up. A change in pain intensity of 30% was used as the cutoff for identifying a clinically meaningful change in these analyses, given previous research that has shown that improvements of 30% or more are associated with patient reports of meaningful change across a number of chronic pain conditions (Farrar, Young, LaMoreaux, Werth, & Poole, 2001).

The amount and reported effects of self-hypnosis and relaxation practice with and without the use of recordings were computed and then compared between the two treatment conditions. Finally, the associations between the potential predictors of treatment response (hypnotizability, pre- and post first session treatment-outcome expectancy) among those in the HYP condition alone and the combined HYP and PMR participants were estimated by computing correlation coefficients between the predictor variables and three measures of treatment outcome: (a) pre- to posttreatment change in daily pain intensity, (b) pretreatment to follow-up changes in daily pain intensity, and (c) posttreatment to follow-up changes in daily pain intensity. Given the small sample size of the current study, which can limit the ability to detect true effects in the correlational analyses, both the significance levels and the overall magnitude of these associations were interpreted, with rs between .10 and.30 deemed as weak, rs between .30 and .50 deemed as moderate, and rs greater than .50 deemed as large associations (Cohen, 1988).

RESULTS

Treatment-Outcome Expectancy

Treatment-outcome expectancy did not differ significantly between the two treatment conditions either before the first treatment session (TES means [SDs] for the HYP and PMR groups, 6.85 [1.40] and 6.79 [1.22], respectively, $t(20) = 0.10$, $p = ns$) or after the first treatment session (means [SDs], 8.08 [1.54] and 7.21 [1.54], $t(20) = 1.24$, $p = ns$). An observation of these means suggested a pre- to postsession increase in outcome expectancy among participants in both conditions, and a possibility that this increase was slightly greater in the HYP group than the PMR group. This was explored further using a repeated measures ANOVA, which yielded a significant time effect, $F(1, 20) = 7.77$, $p < .05$, but not a significant Time × Treatment Condition interaction, $F(1, 20) = 1.82$, $p = ns$. These findings indicate that (a) both conditions had similar effects on outcome expectancies and (b) initial direct experience with either treatment resulted in increases in treatment-outcome expectancy.

Pre- to Postsession Changes in Pain Intensity

The average of the presession and postsession 0–10 pain-intensity ratings for the participants assigned to the HYP and PMR conditions are presented in Table 1. A significant Time × Condition interaction, $F(1, 20) = 5.04$, $p < .05$, indicated differences in pre- to postsession changes in pain intensity between the conditions. Subsequent *t* tests showed a statistically significant, $t(14) = 7.43$, $p < .001$, decrease in pain intensity for the HYP condition, and a smaller but nonsignificant, $t(6) = 1.44$, $p = ns$, decrease in pain intensity for the PMR condition.

Clinically meaningful (30% decrease or more) changes in pain intensity were reported by 13 (87%) of the HYP participants and 4 (57%) of the participants who received PMR. In short, despite similar outcome expectancies in both treatment conditions, and a similar effect on outcome expectancies by both treatments, participants in the HYP condition experienced a greater pre- to postsession decrease in pain intensity than participants in the PMR condition.

Changes in Daily Pain Intensity

The means and standard deviations for the pretreatment, posttreatment, and 3-month follow-up daily pain composites are presented in Table 2. A significant, $F(2, 19) = 4.08$, $p < .05$, Time × Treatment Condition interaction indicated significant differences between the two treatment conditions in change in daily pain over time. Subsequent ANOVAs for each treatment condition separately showed a statistically significant change in daily pain over the three assessment periods for the HYP condition, $F(2, 13) = 9.96$, $p < .001$, but not the PMR condition, $F(2, 5) = 0.99$, $p = ns$. Univariate analyses showed a statistically significant pre- to posttreatment decrease in daily pain for the HYP participants, $t(14) = 4.63$, $p < .001$, but not for the PMR participants, $t(6) = 0.11$, $p = ns$. Moreover, although there was a slight increase in daily pain for the HYP participants from posttreatment to follow-up, this increase was not statistically significant, $t(14) = 1.07$, $p =$ ns, and the decrease in daily pain-intensity scores between pretreatment and 3-month follow-up remained statistically significant, $t(14) = 3.02$, $p < .01$, among the HYP participants. However, among the PMR participants, neither the slight decrease in daily pain from posttreatment to follow-up, nor the difference between pretreatment and follow-up daily pain were statistically significant, $ts(6) = 1.47$ and 1.31, both $ps =$ ns, respectively.

In terms of the rates of clinically meaningful change in daily pain, 7 (47%) of the HYP participants and 1 (14%) of the PMR participants reported a meaningful decrease in daily pain from pre- to posttreatment. These numbers were 7 (47%) and 2 (29%) at the 3-month follow-up for the HYP and PMR participants, respectively.

Changes in Pain Interference

The means and standard deviations for the pretreatment, posttreatment, and 3-month follow-up pain-interference scores are also listed in Table 2. The ANOVAs indicated a nonsignificant trend, $F(2, 19) = 3.26$, $p < .10$, for the Time × Treatment Condition interaction. Subsequent ANOVAs for each condition separately indicated a significant change in pain interference over time for the HYP condition, $F(2, 12) = 7.62$, $p < .001$, but not the PMR condition, $F(2,4) = 1.47$, $p = ns$. Univariate analyses showed a statistically significant pre- to posttreatment decrease in pain interference for the HYP participants, $t(13) = 4.06$, $p < .001$, but not for the PMR participants, $t(5) = 0.48$, $p = ns$. As with daily pain intensity, although there was a slight increase in pain interference for the HYP participants from posttreatment to follow-up, this increase was not statistically significant, $t(13) = 1.25$, $p = ns$, and the difference between pretreatment and follow-up pain interference remained statistically significant, $t(13) = 2.19$, $p < .05$. The slight decrease in pain interference from posttreatment to follow-up reported by the PMR participants was not statistically significant, $t(5) = 1.78$, $p = ns$, nor was the difference between pretreatment and follow-up pain interference, $t(5) = 0.28$, $p = ns$.

Practice With and Without Audio Recordings Posttreatment

Participant reports of the frequency and effects of self-hypnosis and relaxation practice are presented in Table 3. Nonparametric statistics (Mann-Whitney test) were used to compare the groups on these variables, because of the marked positive skew of the distributions in both treatment groups. The findings indicate similar responses of participants in both conditions on most variables. The possible exceptions to this included: (a) a larger median number of days of listening to recordings in the HYP participants (Median 33 days) compared to PMR

participants (Median 12 days); (b) a longer time of pain relief after listening to the HYP recordings (Median 6 hours) than the PMR recordings (Median 2 hours); and (c) a larger median number of days of practicing on their own (without the recording) among the HYP participants (Median, 64 days) than the PMR participants (Median, 35.5 days). However, the differences in these variables were not statistically significant, perhaps due to the large variability in reported amounts and effects of practice, as well as the small sample size.

Prediction of Treatment Outcome

The association between all three treatment-outcome measures and hypnotizability was negligible in the sample as a whole (rs range, −.02 to .03), and weak and nonsignificant (rs range, −.23 to .28) among the HYP participants (see Table 4). Treatment-outcome expectancy assessed before the first treatment session showed a moderate association with changes in pain from posttreatment to 3-month follow-up in both the sample as a whole (r = .40, $p < .10$) and the HYP participants (r = .40, $p = ns$). On the other hand, treatment-outcome expectancy assessed after the first session, that is, after the participants had an opportunity to experience the treatments directly, showed moderate associations with pretreatment to posttreatment and posttreatment to follow-up changes in pain (rs range, .28 to .45 in the sample as a whole and the HYP sample), and strong associations with pretreatment to follow-up changes in daily pain intensity (rs = .55 and .61 for the sample as a whole and the HYP sample, $ps < .01$ and .05, respectively).

Discussion

There are a number of findings from this study that warrant discussion. First, we found that individuals with MS and chronic pain who received a self-hypnosis training intervention reported significantly more benefits from treatment than individuals assigned to a progressive muscle relaxation condition, despite similar treatment outcome expectancies of the participants in the two conditions. Two other important findings concern the prediction of treatment outcome and the use and reported effects of continued self-hypnosis practice after treatment.

Perhaps the largest challenge in designing methodologically sound hypnosis clinical trials is the selection of the control condition (Jensen & Patterson, 2005). A number of control conditions have been used in published hypnosis trials, such as wait-list controls, standard care, and other (active or effective) treatments, among others. Because each of these controls for different possible confounds, any study that uses one or more of these control conditions contributes to our understanding of the specific and nonspecific effects of hypnotic interventions.

Although this study was quasi-experimental because it did not include randomization of all participants, we were able to compare self-hypnosis training to a PMR intervention. This intervention was designed to meet the need to control for treatment-outcome expectancies. Like the hypnosis treatment, it was based on an intervention that has demonstrated efficacy for treating chronic pain, could be described in a way that elicited positive outcome expectancies, could be labeled similarly to the hypnosis treatment (i.e., as an intervention that includes “both hypnosis and relaxation components”) and could be provided in a way that was also very similar to the hypnotic intervention (e.g., face-to-face in 10 sessions, with an accompanying audio recording, etc.). However, the PMR condition in this study differed from the HYP condition in several critical ways, the most important of which was the fact that the PMR condition consisted of only one (but constantly repeated) direct suggestion: to experience relaxation in specific areas of the body. The hypnotic intervention, on the other hand, included a hypnotic induction followed by a much larger number and variety of suggestions, including, in the first two sessions: (a) a suggestion to experience being in a “special place,” (b) a classic hypnotic suggestion to encourage confidence in responsivity, (c) five different analgesia suggestions,

(d) posthypnotic suggestions that the benefits obtained with treatment will last beyond the session and become permanent, as well as (e) any additional suggestion that the participant might want to hear during the sessions (to facilitate greater involvement in the sessions and tailoring of treatment). The five analgesia suggestions provided in the first two sessions were reduced to two suggestions (a suggestion for decreased pain unpleasantness plus whatever other analgesia suggestion the participants appeared to enjoy the most or get the most out of), but all of the other suggestions continued for the remaining eight sessions.

Thus, the HYP and PMR treatment conditions shared many key nonspecific components, including their effects on outcome expectancy but differed with respect to the number and variety of suggestions offered. Moreover, both interventions had similar effects on outcome expectancies. Given the fact that the hypnotic-analgesia protocol was more effective than the PMR comparison condition, the findings suggest (but only suggest; see discussion of limitations of quasi-experimental designs, below) that the hypnotic suggestions included in the HYP treatment had an effect on these outcome variables over and above the effects of therapist attention, time, or outcome expectancy.

We examined two predictors of treatment response in this study: hypnotizability and treatment-outcome expectancy. Of these two, only treatment-outcome expectancy was associated (moderately to strongly) with outcome. The lack of a significant association between hypnotizability and treatment outcome is inconsistent with some previous findings in clinical settings (e.g., Andreychuk & Skriver, 1975; Friedman & Taub, 1984; Gay, Philipport, & Luminet, 2002) but is consistent with a previous study by our group using a similar treatment protocol (Jensen et al., 2005). The inconsistencies across studies concerning the relative importance of hypnotizability as a predictor may be related to differences between studies in the way that hypnotizability is assessed, differences in the treatment protocols used, differences in the samples or types of pain studied, or some combination of these.

Even when significant associations between hypnotizability and treatment outcome are found, however, they are not always strong for all outcome measures (Friedman & Taub, 1984; Gay et al., 2002). The skills needed to respond to hypnotic suggestions for pain management, even in the best of circumstances, may not always be strongly related to the skills necessary to respond to the hypnotic suggestions contained in common hypnotizability tests, such as suggestions for arm levitation, amnesia, or visual hallucinations. Hypnotic responding is not necessarily a single unified trait and may be composed of multiple abilities (cf. Pekala & Kumar, 2007), some of which may be associated with response to analgesia suggestions and others of which may not. In any case, as a group, these findings suggest that it is probably not useful to screen individuals from hypnotic treatment for chronic pain management based on their response to hypnotizability tests alone. Such screening may, in fact, exclude some patients from a treatment they could benefit from.

On the other hand, treatment-outcome expectancy did show a moderate to strong association with treatment outcome in this study. Although the present findings do not support a conclusion that the effects of self-hypnosis training are entirely due to expectancy effects (otherwise, we would have seen a similar treatment effect for the two conditions), the findings are consistent with the hypothesis that patient expectancies may play a role in both immediate and short-term (at least up to 3 months) outcomes in response to hypnotic analgesia treatment for chronic pain (Kirsch, 1985); although the importance of outcome expectancies in hypnotic responding may be much less than is commonly thought (Benham, Woody, Wilson, & Nash, 2006). Practically, the findings suggest the possibility that clinicians might be able to enhance treatment outcome to some extent by presenting treatment in a way that realistically describes treatment and its possible effects and also facilitates patient expectancies and hope for positive outcomes. This possibility certainly warrants further investigation. Research that identifies ways to enhance

outcome expectancies in the clinical setting, and then determines the impact of this enhancement on clinical outcome, could be particularly useful to help (a) provide additional tests of the relative importance of expectancy in determining response to hypnotic treatment and (b) possibly enhance the efficacy of hypnotic analgesia treatment.

Three limitations of the current study should be kept in mind when interpreting the results: (a) the quasi-experimental design; (b) the low sample size; and (c) the "active" nature of the comparison (PMR) condition. Although it was important to include 8 of the participants in the analyses of the HYP condition who had been given HYP from the start in order to increase the power of the analyses, the inclusion of these participants in the analyses limits our ability to draw causal conclusions about the effects of HYP versus PMR from the study. Future research, ideally with larger sample sizes, will be needed to determine the extent to which the findings replicate to other samples. In addition, the low sample size limits the ability of the study to detect effects that might exist in the population but did not emerge in the sample. For example, although both interventions resulted in reduced pain, only the reduction observed in the HYP condition was statistically significant. It is possible that the pain reduction reported by participants in the PMR condition might have been found to be statistically significant had there been a larger number of participants in the study who received PMR. Similarly, some of the differences observed between the two treatment conditions concerning the effects of practice on pain (for example, that the HYP recordings reportedly resulted in more hours of pain relief than the PMR recordings did) might have been statistically significant had we had more resources to recruit additional participants for the study. Future researchers should strive to maximize the numbers of participants in hypnosis clinical trials to be better able to detect true effects or to be more confident that such effects do not exist when a lack of significant difference is found.

The strengths of the PMR comparison condition we used in this study have already been discussed. But all comparison or control conditions used in hypnosis studies have both strengths and weaknesses. A primary weakness of the PMR condition used in this study, already alluded to, is that it is an active condition that, in fact, may benefit individuals via similar mechanisms as hypnosis. PMR has been found to be effective for pain management in other studies (e.g., Baird & Sands, 2004; Crockett, Foreman, Alden, & Blasberg, 1986) and was associated with a reduction in pain (at least from pre- to postsession) in the current study. Because PMR is an active (and potentially effective) treatment, the differences noted between HYP and PMR in this study may underestimate the actual effects of the HYP intervention if compared to an inactive control or no treatment. It is difficult to isolate the unique components of the HYP intervention from those we might employ in a comparison condition. Thus, although the comparison condition was useful for testing and confirming an effect of the hypnosis treatment over and above the effects of time, therapist attention, and patient expectancy, because it is an active treatment we may interpret the results in ways that understate the effectiveness of the hypnosis treatment. For this reason, the PMR condition is not useful for determining the effects of hypnosis relative to no treatment or "nonhypnotic" care. Estimating these treatment effects would have required a third condition, such as a wait-list control. Future researchers would be wise to include such a condition whenever possible; although we understand that the resources available for conducting a clinical trial are often limited, and that the requirements for statistical power may require a limitation in the number of treatment conditions offered in any one study.

We have previously argued that no single hypnosis clinical trial can be definitive, and there is no such thing as a perfect control condition for hypnosis studies (Jensen & Patterson, 2005). Rather, in order for our understanding of the effects of hypnosis on pain and other conditions to advance, the field requires multiple clinical trials and studies that compare hypnotic interventions to a variety of control conditions and interventions. Ultimately, such a series of studies will produce a body of evidence that can help to clarify the efficacy and impact of

hypnosis on pain and other symptoms. For the present, however, the results we report here encourage further examination of the clinical utility of hypnotic methods for chronic pain management.

REFERENCES

Andreychuk T, Skriver C. Hypnosis and biofeedback in the treatment of migraine headache. International Journal of Clinical and Experimental Hypnosis 1975;23:172–183. [PubMed: 1132914]

Archibald CJ, McGrath PJ, Ritvo PG, Fisk JD. Pain prevalence, severity and impact in a clinic sample of multiple sclerosis patients. Pain 1994;5:89–93. [PubMed: 7970843]

Baird CL, Sands L. A pilot study of the effectiveness of guided imagery with progressive muscle relaxation to reduce chronic pain and mobility difficulties of osteoarthritis. Pain Management Nursing 2004;5:97–104. [PubMed: 15359221]

Beiske AG, Pedersen ED, Czujko B, Myhr KM. Pain and sensory complaints in multiple sclerosis. European Journal of Neurology 2004;11:479–482. [PubMed: 15257687]

Benham G, Woody EZ, Wilson KS, Nash MR. Expect the unexpected: Ability, attitude, and responsiveness to hypnosis. Journal of Personality and Social Psychology 2006;91:342–350. [PubMed: 16881769]

Bernstein, DA.; Borkovec, TD. Progressive relaxation training: A manual for the helping professions. Champaign, IL: Research Press; 1973.

Brandt J, Spencer M, Folstein M. The telephone interview for cognitive status. Neuropsychiatry, Neuropsychology & Behavioral Neurology 1988;1:111–117.

Chambless DL, Tran GQ, Glass CR. Predictors of response to cognitive-behavioral group therapy for social phobia. Journal of Anxiety Disorders 1997;11:221–240. [PubMed: 9220298]

Cleeland CS, Ryan KM. Pain assessment: Global use of the Brief Pain Inventory. Annals of the Academy of Medicine 1994;23:129–138.

Cohen, J. Statistical power analysis for the behavioral sciences. Vol. 2nd ed.. Hillsdale, NJ: Lawrence Erlbaum; 1988.

Cook, TD.; Campbell, DT. Ouasi-experimentation: Design & analysis issues for field settings. Boston: Houghton Mifflin; 1979.

Crockett DJ, Foreman ME, Alden L, Blasberg B. A comparison of treatment modes in the management of myofascial pain dysfunction syndrome. Biofeedback and Self-Regulation 1986;11:279–291. [PubMed: 3607094]

Dane JR. Hypnosis for pain and neuromuscular rehabilitation with multiple sclerosis: Case summary, literature review, and analysis of outcomes. International Journal of Clinical and Experimental Hypnosis 1996;44:208–231. [PubMed: 8690534]

Daut RL, Cleeland CS, Flannery RC. Development of the Wisconsin Brief Pain Questionnaire to assess pain in cancer and other diseases. Pain 1983;17:197–210. [PubMed: 6646795]

Ehde DM, Gibbons LE, Chwastiak L, Bombardier CH, Sullivan MD, Kraft GH. Chronic pain in a large community sample of persons with multiple sclerosis. Multiple Sclerosis 2003;9:605–611. [PubMed: 14664474]

Ehde DM, Osborne TL, Hanley MA, Jensen MP, Kraft GH. The scope and nature of pain in persons with multiple sclerosis. Multiple Sclerosis 2006;12:629–638. [PubMed: 17086910]

Ehde DM, Osborne TL, Jensen MP. Chronic pain in persons with multiple sclerosis. Physical Medicine and Rehabilitation Clinics of North America 2005;16:503–512. [PubMed: 15893684]

Farrar JT, Young JP, LaMoreaux L, Werth JL, Poole RM. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. Pain 2001;94:149–158. [PubMed: 11690728]

Friedman H, Taub HA. Brief psychological training procedures in migraine treatment. American Journal of Clinical Hypnosis 1984;26:187–200. [PubMed: 6435442]

Gay M, Philipport P, Luminet O. Differential effectiveness of psychological interventions for reducing osteoarthritis pain: A comparison of Erikson hypnosis and Jacobson relaxation. European Journal of Pain 2002;6:1–16. [PubMed: 11888223]

Goodin DS. Survey of multiple sclerosis in Northern California. Northern California MS Study Group. Multiple Sclerosis 1999;5:78–88. [PubMed: 10335515]

Hadjimichael O, Kerns RD, Rizzo MA, Cutter G, Vollmer T. Persistent pain and uncomfortable sensations in persons with multiple sclerosis. Pain 2007;127:35–41. [PubMed: 16949751]

Heimbeg RG, Dodge CS, Hope DA, Kennedy CR, Zollo LJ. Cognitive behavioral group treatment for social phobia: Comparisons with a credible placebo control. Cognitive Therapy and Research 1990;14:1–23.

Hilgard, ER.; Hilgard, JR. Hypnosis in the relief of pain. New York: Brunner/Mazel; 1994.

Holt CS, Heimberg RG. The Reaction to Treatment Questionnaire: Measuring treatment credibility and outcome expectancies. Behavior Therapist 1990;113:213–214.

Indaco A, Iachetta C, Nappi C, Socci L, Carrieri PB. Chronic and acute pain syndromes in patients with multiple sclerosis. Acta Neurologica (Napoli) 1994;16:97–102.

Jacobson, E. You must relax. Vol. 5th ed. New York: McGraw Hill; 1976.

James FR, Large RG, Beale IL. Self-hypnosis in chronic pain: A multiple baseline study of five highly hypnotizable subjects. Clinical]ournal of Pain 1989;5:161–168.

Jensen MP, Barber J, Hanley MA, Engel JM, Romano JM, Cardenas DD, et al. Long-term outcome of hypnotic analgesia treatment for chronic pain in persons with disabilities. International Journal of Clinical and Experimental Hypnosis 2008;56:157–170.

Jensen MP, Hanley MA, Engel JM, Romano JM, Barber J, Cardenas DD, et al. Hypnotic analgesia for chronic pain in persons with disabilities: A case series. International Journal of Clinical and Experimental Hypnosis 2005;53:198–228. [PubMed: 16025734]

Jensen, MP.; Karoly, P. Self-report scales and procedures for assessing pain in adults. In: Turk, DC.; Melzack, R., editors. Handbook of pain assessment. Vol. 2nd ed. New York: Guilford; 2001. p. 15-34.

Jensen MP, Patterson DR. Control conditions in hypnotic analgesia clinical trials: Challenges and recommendations. International Journal of Clinical and Experimental Hypnosis 2005;53:170–197. [PubMed: 16028332]

Jensen MP, Patterson DR. Hypnotic treatment of chronic pain. Journal of Behavioral Medicine 2006;29:95–124. [PubMed: 16404678]

Jensen MP, Turner JA, Romano JM, Fisher L. Comparative reliability and validity of chronic pain intensity measures. Pain 1999;83:157–162. [PubMed: 10534586]

Kirsch I. Response expectancy as a determinant of hypnotic behavior. American Psychologist 1985;40:1189–1202.

Montgomery GH, DuHamel KN, Redd WH. A meta-analysis of hypnotically induced analgesia: How effective is hypnosis? International Journal of Clinical and Experimental Hypnosis 2000;48:138–153. [PubMed: 10769981]

O'Connor AB, Schwid SR, Herrmann DN, Markman JD, Dworkin RH. Pain associated with multiple sclerosis: Systematic review and proposed classification. Pain 2007;137:96–111. [PubMed: 17928147]

Osborne TL, Ehde DM, Jensen MP, Kraft GH. The reliability and validity of pain interference measures in persons with multiple sclerosis. Journal of Pain and Symptom Management 2006;32:217–229. [PubMed: 16939846]

Patterson DR, Jensen MP. Hypnosis and clinical pain. Psychological Bulletin 2003;29:495–521. [PubMed: 12848218]

Pekala, RJ.; Kumar, VK. An empirical-phenomenological approach to quantifying consciousness and states of consciousness: With particular reference to understanding the nature of hypnosis. In: Jamison, GA., editor. Hypnosis and conscious states: The cognitive neuro-science perspective. Oxford, UK: Oxford University Press; 2007. p. 167-194.

Rae-Grant AD, Eckert NJ, Bartz S, Reed JF. Sensory symptoms of multiple sclerosis: A hidden reservoir of morbidity. Multiple Sclerosis 1999;5:179–183. [PubMed: 10408718]

Safren SA. Clients' expectancies and their relationship to pretreatment symptomatolgy and outcomes of cognitive-behavioral group treatment for social phobia. Journal of Consulting and Clinical Psychology 1997;65:694–698. [PubMed: 9256571]

Solaro C, Brichetto G, Amato MP, Cocco E, Colombo B, D'Aleo G, et al. The prevalence of pain in multiple sclerosis: A multicenter cross-sectional study. Neurology 2004;63:919–921. [PubMed: 15365151]

Stenager E, Knudsen L, Jensen K. Acute and chronic pain syndromes in multiple sclerosis. Acta Neurologica (Scandinavica) 1991;84:197–200. [PubMed: 1950460]

Stenager E, Knudsen L, Jensen K. Acute and chronic pain syndromes in multiple sclerosis. A 5-year follow-up study. Italian Journal of Neurological Sciences 1995;16:629–632.

Sutcher H. Hypnosis as adjunctive therapy for multiple sclerosis: A progress report. American Journal of Clinical Hypnosis 1997;39:283–290. [PubMed: 9141305]

Svendsen KB, Jensen TS, Overvad K, Hansen HJ, Koch-Henriksen N, Bach FW. Pain in patients with multiple sclerosis: A population-based study. Archives of Neurology 2003;60:1089–1094. [PubMed: 12925364]

Turk DC, Dworkin RH, Allen RR, Bellamy N, Brandenburg N, Carr DB, et al. Core outcome domains for chronic pain clinical trials: IMMPACT recommendations. Pain 2003;106:337–345. [PubMed: 14659516]

Tyler EJ, Jensen MP, Engel JM, Schwartz L. The reliability and validity of pain interference measures in persons with cerebral palsy. Archives of Physical Medicine and Rehabilitation 2002;83:236–239. [PubMed: 11833028]

Table 1

Means and SDs for the Average of the Current Pain Ratings Obtained Just Before and Just After Each Session for Each Treatment Condition

Treatment Condition	Presession		Postsession		*t* (*df*) for Time Effect	*F* (*df*) for Time × Condition Interaction
	Mean	SD	Mean	SD		
Hypnosis	3.21	1.76	1.32	1.28	7.43 (14)***	5.04 (1, 20)*
Relaxation	2.82**	1.58	2.08	1.58	1.43 (6)	

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Means and SDs for the Daily Pain Intensity Composite and Pain Interference Scores at Pretreatment, Posttreatment, and 3-Month Follow-Up

Treatment Condition	Pretreatment		Posttreatment		3-Month Follow-up		*F (df)* for Time Effect	*F(df,* for Time × Condition Interaction
	Mean	*SD*	Mean	*SD*	Mean	*SD*		
Daily pain-intensity composite								
Hypnosis	4.55_a	1.35	3.17_b	1.75	3.48_b	2.04	9.97 (2, 13)***	4.08 (2, 19)*
Relaxation	4.08_a	1.38	4.13_a	1.69	3.35_a	1.92	0.99 (2, 5)	
Pain interference (modified BDI score)								
Hypnosis	4.66_a	1.87	3.16_b	2.41	3.78_b	2.13	7.62 (2, 12) ***	3.29 (2, 17)†
Relaxation	4.46_a	3.25	4.67_a	2.98	4.35_a	3.17	1.47(2, 4)	

Note. Means with different subscripts are significantly different ($p < .05$) from one another.

† $p < .10$.

* p <.05.

** $p < .01$.

*** $p < .001$.

Table 3

Self-Hypnosis and Relaxation Practice, With and Without Audio Recording, in the 3 Months Following Treatment (Complete Data from 19 Participants)

	Treatment Condition	
	Hypnosis (N = 13)	**Relaxation (N = 6)**
With audio recording		
Rate of practicing with recording at least once		
Number (percent)	11 (85%)	6 (100%)
Days of practice with recording in the last 3 months		
Median	33	12
Range	0–82	10–84
Number of practices with recording per day (of those who practice)		
Median	1	1
Range	1–3	1–2
Amount of pain relief with recording (0 – 10)		
Median	6	5
Range	3–10	3–10
Hours of relief (of those who practice with recording)		
Median	6	2 hrs
Range	1–24 hrs	0–24 hrs
Without audio recording (on own)		
Rate of practicing without recording at least once		
Number (percent)	8 (62%)	4 (67%)
Days of practice without recording in the last three months		
Median	64	35.5
Range	24–88	15–18
Number of practices without recording per day		
Median	1	1
Range	1–4	1–4
Amount of relief without recording (0–10)		
Median	6	5
Range	1–10	1–10
Hours of relief (of those who practice without recording)		
Median	2	2
Range	0–24 hrs	0.5–24 hrs

Table 4

Association (Spearman Rhos) Between Change in Daily Pain Intensity Following Treatment for Participants in the Hypnosis Condition and Both Treatment Conditions Combined

Predictor	Pretreatment to Posttreatment	Pretreatment to Follow-up	Posttreatment to Follow-up
All participants (N = 22)			
Hypnotizability	.03	.02	–.02
Presession 1 outcome expectancy	–.12	.17	.40†
Postsession 1 outcome expectancy	.34	.55**	.28
Hypnosis participants (*N*= 15)			
Hypnotizability	–.23	–.21	.28
Presession 1 outcome expectancy	–.08	.26	.40
Postsession 1 outcome expectancy	.29	.61*	.45†

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.