



## Effects of Self-Hypnosis Training and Cognitive Restructuring on Daily Pain Intensity and Catastrophizing in Individuals With Multiple Sclerosis and Chronic Pain

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# EFFECTS OF SELF-HYPNOSIS TRAINING AND COGNITIVE RESTRUCTURING ON DAILY PAIN INTENSITY AND CATASTROPHIZING IN INDIVIDUALS WITH MULTIPLE SCLEROSIS AND CHRONIC PAIN<sup>1</sup>

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**Abstract:** Fifteen adults with multiple sclerosis were given 16 sessions of treatment for chronic pain that included 4 sessions each of 4 different treatment modules: (a) an education control intervention; (b) self-hypnosis training (HYP); (c) cognitive restructuring (CR); and (d) a combined hypnosis-cognitive restructuring intervention (CR-HYP). The findings supported the greater beneficial effects of HYP, relative to CR, on average pain intensity. The CR-HYP treatment appeared to have beneficial effects greater than the effects of CR and HYP alone. Future research examining the efficacy of an intervention that combines CR and HYP is warranted.

Pain is a common and often refractory problem in many individuals with multiple sclerosis (MS; e.g., Kenner, Menon, & Elliott, 2007; O'Connor, Schwid, Herrmann, Markman, & Dworkin, 2008). Although relatively few treatments have been identified as efficacious for the treatment of MS-related pain, nonpharmacological approaches such as cognitive restructuring (CR) and hypnosis (HYP) have been evaluated as potential treatments for managing pain in MS. HYP for chronic pain commonly focuses on improving the subjective experience of pain and often uses hypnotic suggestions related to dissociation from pain, pain intensity reduction, and changing the pain sensation to

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something less distressing (e.g., numbness) (e.g., Abrahamsen, Baad-Hansen, & Svensson, 2008; Abrahamsen, Zachariae, & Svensson, 2009; Jensen, Barber, Romano, Hanley, et al., 2009; Jensen, Barber, Romano, Molton, et al., 2009; Jones, Cooper, Miller, Brooks, & Whorwell, 2006). Uncontrolled case reports and case series (Dane, 1996; Jensen et al., 2005) support the beneficial effects of self-hypnosis training for reducing pain intensity in individuals with MS and chronic pain. In a recently published controlled clinical trial, Jensen and colleagues found that HYP was superior to progressive muscle relaxation in reducing pain intensity and pain interference from pre- to posttreatment (Jensen, Barber, Romano, Molton, et al., 2009).

One factor that has been consistently associated with both pain intensity and pain interference in individuals with chronic pain is catastrophizing (Keefe, Rumble, Scipio, Giordano, & Perri, 2004). Pain-related catastrophizing involves a tendency to focus on pain as well as a tendency to evaluate pain and its effects in unrealistic and overly negative terms. Correlational research supports consistent and strong associations between catastrophizing and numerous measures of patient functioning (Keefe et al., 2004; Quartana, Campbell, & Edwards, 2009), including patients with MS (Osborne, Jensen, Ehde, Hanley, & Kraft, 2007).

The clinical strategy that is most commonly used for decreasing pain-related catastrophizing is cognitive restructuring (CR; also known as cognitive therapy). CR involves teaching patients to evaluate their thoughts and beliefs about pain, challenge those thoughts that are deemed alarming or not helpful (e.g., catastrophizing cognitions) and develop and reinforce thoughts that will contribute to better outcomes (Ehde & Jensen, 2004; Thorn, 2004). Evidence supports the beneficial effects of CR on catastrophizing cognitions (Thorn et al., 2007), as well as on other outcome variables, such as pain intensity (Ehde & Jensen, 2004) and depression and anxiety (Thorn et al., 2007).

Given the different primary treatment targets of HYP and CR (pain intensity and catastrophizing cognitions, respectively), as well as the evidence supporting the efficacy of HYP and CR on these treatment targets, cited above, it would be reasonable to hypothesize that hypnotic analgesia may have larger effects on the sensory qualities of pain (intensity) than the cognitive or evaluative aspects of pain (including catastrophizing cognitions), and that CR may show the opposite pattern (i.e., greater effects on catastrophizing than on pain intensity). If these hypotheses are supported, then they would have important clinical implications. For example, patients with chronic pain who report high levels of pain intensity may benefit more from learning how to use self-hypnosis for pain management than from CR. On the other hand, patients with chronic pain who evidence high levels of

catastrophizing may benefit more from CR than self-hypnosis training. Patients who evidence both high levels of pain and catastrophizing may benefit from both CR and self-hypnosis training.

Traditionally, the primary goals of hypnotic analgesia and CR have been to reduce pain intensity and maladaptive cognitions, respectively, with the expectation that reductions in these variables would then translate to other benefits (e.g., reduced pain interference with functioning, improved mood). Clinicians have recently proposed that hypnosis and hypnotic interventions may also be used to address these other outcomes via hypnotic suggestions that focus on changes in cognitions and behavior directly (rather than indirectly via suggestions that focus on changes in pain experience; see Patterson & Jensen, 2003). Along this line of thinking, clinicians who specialize in hypnosis interventions have begun to create hypnotic protocols and procedures that can be used to address depression, with an emphasis to encourage: (a) an ability to tolerate ambiguity (Yapko, 2001, 2006); (b) a client's sense of hope and positive expectancies for the future (Torem, 2006; Yapko, 2001, 2006); (c) general cognitive flexibility (Yapko, 2001); (d) a client's ability to recall positive experiences from the past (Lankton, 2006); and (e) replacement of faulty cognitions with more adaptive ones (Alladin, 2006, 2008). It seems reasonable, therefore, that some of these current hypnotic procedures for the treatment of depression could be adapted to target pain-related catastrophizing cognitions specifically; although to our knowledge no such procedures have been developed or tested empirically.

The current pilot study was designed to address two related goals. First, we sought to test hypothesized differential effects of HYP versus CR on pain intensity and catastrophizing. We hypothesized that HYP emphasizing pain reduction would result in larger reductions in pain intensity than a CR intervention emphasizing the reduction of catastrophizing cognitions, and that the CR intervention would result in larger reductions in catastrophizing cognitions than HYP. Second, we sought to explore whether an intervention that combined HYP and CR (CR-HYP) to reduce catastrophizing cognitions and to enhance adaptive (reassuring) cognitions in the context of hypnosis would provide additional benefits on either pain intensity or catastrophizing in patients who received this treatment after CR and HYP.

## METHOD

### *Participants*

Twenty-two individuals with MS and chronic pain were enrolled in the study. Twenty were recruited from previous survey studies conducted at the University of Washington (Bamer, Johnson, Amtmann, &

Kraft, 2008; Osborne, Ehde, Jensen, & Kraft, 2006), and 2 were referred by local MS care providers. Patients were eligible to participate if they (a) had a diagnosis of MS, (b) were at least 18 years old, (c) possessed basic proficiency in the English language, and (d) reported chronic (i.e., duration of at least 6 months) daily pain intensity averaging at least 4/10 on a 0 to 10 numerical rating scale. Exclusion criteria included (a) psychiatric hospitalization in the past 6 months; (b) self-reported use of anti-psychotic medications; (c) past year utilization of hypnosis or cognitive behavioral therapy for pain management in the context of treatment or research; (d) participation in counseling and/or psychotherapy more than once a week; (e) endorsement of active suicidal ideation with intent within the past 6 months, or evidence of psychotic symptoms; and (f) a score of 20 or less 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.

Of the 22 patients who were enrolled, 2 withdrew during the initial pretreatment assessments; 1 due to a loss of interest and the second because of significant health problems. Four participants withdrew from the entire study at some point during the 16 treatment sessions, and 1 participant discontinued treatment but participated in the remaining study assessments, leaving a total of 15 participants who completed treatment and outcome assessment. The mean age of the 15 participants was 52.6 years (range = 41–65 years). Most (80%) were women, and 13 (87%) were Caucasian. One participant identified as African American, and 1 identified as both Caucasian and African American.

### *Study Design*

This study used a within-subject treatment comparison design, with each of the study participants receiving four sessions each of four different treatment conditions: (a) an education control condition (CONT); (b) a self-hypnosis training condition focusing primarily on pain reduction (HYP); (c) a cognitive restructuring treatment condition focusing primarily on replacing pain-related catastrophizing thoughts with reassuring thoughts (CR); and (4) a hybrid treatment based on published descriptions of hypnotic treatments for depression (see below), adapted to focus on cognitions related to chronic pain (CR–HYP). All participants first received four sessions of CONT. They were then randomly assigned to receive four sessions each of HYP and CR in one of two orders: (a) HYP followed by CR or (b) CR followed by HYP. All participants were then given four sessions of CR–HYP. Primary and secondary outcome measures were assessed at five assessment time points, before the initial treatment module and after each of the four treatment modules. Assessments were completed

via paper-and-pencil questionnaires (catastrophizing cognitions, pain interference) and telephone interviews (average and worst daily pain intensity).

### *Intervention Protocols*

All four treatment conditions were described to the participants in a way that would yield similar treatment outcome expectancies. Specifically, the participants were told that the treatments and treatment components have been shown to be helpful for chronic pain, and that the purpose of the current study was to see which treatments and/or components would be most beneficial to individuals with MS and chronic pain. They were also told that the focus of the intervention was to give them information about chronic pain and to teach them skills to alter how their brain processes pain information to foster potential pain relief and greater comfort.

*Education control (CONT).* The CONT sessions were adapted from education control treatments that our research group has used successfully in the past as a control condition in clinical research (Ehde & Jensen, 2004). Additional information on the neurophysiology of pain was adapted from a recent review article on this topic (Jensen, 2010). Specifically, participants were given information about (a) the scope and effects of pain in individuals with MS, (b) the neurophysiology of pain, (c) sleep and sleep hygiene, and (d) pacing and activity management. Discussion regarding these topics was encouraged during the sessions. However, the clinicians were instructed not to teach any specific pain-coping skills (e.g., relaxation, self-hypnosis, or CR skills). In our previous research, participants reported that they were highly satisfied with such education sessions; as satisfied, in fact, as they were with CR (Ehde & Jensen, 2004).

*Cognitive restructuring (CR).* The CR intervention was a four-session version of the CR intervention used in previous research (Ehde & Jensen, 2004), which itself was adapted from published descriptions of CR interventions designed to treat a variety of medical and psychological disorders, including chronic pain and depression (e.g., Beck, 1995; Bradley, 1996; Thorn, 2004). The four primary components of the CR intervention were (a) education about the role of cognitions in pain, (b) cognitive coping skills acquisition, (c) rehearsal of cognitive coping skills, and (d) encouragement of maintenance and generalization of skills. Participants were taught how to complete thought records to evaluate catastrophic pain thoughts and were asked to complete these between sessions as homework. Core beliefs about chronic pain were also examined, and participants were instructed in the skill of thought stopping (e.g., using the image of a "stop sign" or an imagined voice saying "Stop!" to replace the unhelpful thoughts) when appropriate.

Participants were encouraged to continue using these skills after the end of the CR module.

*Self-hypnosis training (HYP).* The HYP protocol was a four-session version of a 10-session treatment protocol used in our previous studies (Jensen, Barber, Romano, Hanley, et al., 2009; Jensen, Barber, Romano, Molton, et al., 2009). HYP included hypnosis (interactions with a clinician that included an induction followed by a series of suggestions for analgesia and comfort). As in previous studies (e.g., Jensen, Barber, Romano, Hanley, et al., 2009; Jensen, Barber, Romano, Molton, et al., 2009), 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 hypnotic effects.

This treatment module had two primary goals: (a) to make long-lasting changes in the way participants process nociception and pain information, such that they experience less pain and less pain-related distress; and (b) to teach a specific skill participants could use when they chose to experience an immediate reduction in pain intensity or pain affect that could last for a period of time (ideally hours or even longer). Each session included (a) an initial discussion of the participant's experiences since the previous treatment session, with an adjustment of hypnosis suggestions based on information obtained from the discussion (i.e., the specific wording and types of suggestions could be tailored to each individual participant to some extent); (b) a discussion of home practice completed since the previous session, and encouragement of ongoing and continued use of home practice; (c) 20–35 minutes of formal hypnosis; and (d) posthypnosis discussion of the participant's experience during the session, with the clinician addressing any questions or concerns.

Each hypnosis session began with a prehypnosis cue (to “. . . take a deep, refreshing breath and hold it . . . hold it for a moment . . . and let it go . . .”) that gave participants a cue they could use for experiencing self-hypnosis outside of the session. Next, a 10-minute standardized (relaxation) induction was provided, followed by a suggestion that the participant experience himself or herself as being in a peaceful place where he/she feels safe and comfortable. Four specific suggestions for analgesia and well-being that lasted approximately 5 minutes each were then provided: (a) decreased unpleasantness and increased pain acceptance (i.e., giving up the “struggle” against pain); (b) decreased awareness of uncomfortable sensations; (c) imagined anesthesia; and (d) increased awareness of comfort and comfortable sensations. In addition, participants could request up to two additional suggestions (e.g., for improved sleep, increased energy, improved memory, etc.) for changes in their perceived symptoms or emotional experience. The first session ended with a series of three posthypnotic suggestions: (a) that the experience of analgesia,

relaxation, and comfort will stay with the participant and linger beyond the session, lasting for “. . . hours, days, weeks, and years”; (b) that the more the participant practices self-hypnosis by listening to session recordings and by using the deep breathing cue to enter a hypnotic state and reexperience the comfort of hypnosis without the recording, the more effective and longer lasting the suggestions will be; and (c) that entering a relaxed and absorbed state using the specific cue will become easier over time with practice, and that the participant can do so any time he or she wishes to experience comfort. Posthypnotic suggestions were also made to increase participants’ confidence in using the hypnotic skills as well as instilling a sense of control over pain and its impact.

The hypnotic inductions and suggestions provided during the second, third, and fourth sessions could potentially be identical to those provided in the first session, especially if the participant reported significant benefits with the first session and the clinician concluded no changes would improve the participant’s response. However, changes were also allowed (and, in fact, were always made) based on feedback that was obtained immediately after each session or at the beginning of the next session concerning the participant’s responses and preferences. Audio recordings were made of all four sessions, and participants were asked to listen to at least one of the recordings (of their choice) at least once a day throughout the HYP treatment module.

*Combined cognitive-restructuring and self-hypnosis training (CR–HYP).* Much of the content of the CR–HYP module was based on the hypnotic strategies described by clinicians for treating depression (e.g., Alladin, 2006, 2008; Torem, 2006; Yapko, 2001, 2006). The four primary goals of the CR–HYP module were (a) to increase each participant’s comfort with having a sense of ambiguity about the meaning of pain sensations; (b) to encourage the belief that the participant can gain control over pain and its impact (i.e., self-efficacy beliefs); (c) to automatize the process of CR, such that alarming or catastrophizing cognitions are automatically monitored and adjusted into more reassuring and realistic cognitions, and the participant is reassured that this process can occur all the time, even below the participant’s awareness, before any maladaptive cognitions can have any negative effects on mood, pain, or functioning; and (d) to increase a sense of control over pain and its effects by imagining what this control would feel like (in the future), and integrating these feelings of increased control into the present (e.g., Torem, 2006).

The first session focused specifically on hypnotic suggestions (following a relaxation induction and peaceful place imagery) that would increase the participant’s comfort with ambiguity about conclusions regarding pain and its impact. The underlying assumption is that increased acceptance of ambiguity is inconsistent with jumping to



negative conclusions about pain, including catastrophizing conclusions. This intervention can be viewed as a type of hypnotic de-catastrophizing intervention, largely following the protocol described by Yapko (2006) for treating depression with hypnosis. The second and third sessions used the focused attention element of hypnosis to encourage the process of altering pain-related catastrophizing and any other alarming or maladaptive cognitions into more reassuring and realistic cognitions. Participants were also encouraged to ponder any reassuring and realistic cognitions that were identified as helpful during the CR module ("These are thoughts that you have identified as realistic and reasonable for you. And to the extent that they continue to be reassuring . . . you can ponder these thoughts again right now . . . just take a moment to review these thoughts in your mind, and why they are accurate"). The final session used an age-progression strategy (based in large part to the "Back from the Future" strategy described by Torem, 2006) to increase the participants' sense of control over pain and its effects on their lives. All four sessions were recorded, and participants were asked to listen to at least one of the recordings made at least once daily. They were encouraged to listen to a previous recording if they found it more helpful than the most recent recording.

### *Measures*

*Primary outcome variables.* The primary outcome variables for this study were average pain intensity (including both [a] current pain intensity, collected by the clinician before and after each treatment *session* and [b] average daily pain, assessed before the initial treatment module and after each treatment *module* by research staff via telephone) and frequency of catastrophizing cognitions. Pain intensity was assessed using 0-to-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). The 0-to-10 NRS has been recommended as a useful measure of this pain domain due to its strong validity, understandability and ease of use, and ease of administration and scoring (Jensen & Karoly, 2001).

Current pain-intensity ratings were obtained from the participants by the treating clinician before and after every session. The four presession and postsession ratings from each treatment module were averaged to create composite pre- and postsession pain-intensity scores. Average daily pain intensity was assessed by telephone interview by a research assistant blind to treatment condition before the initial treatment module as well as after each treatment module. To assess this outcome variable, participants were telephoned on four separate days within a 7-day window and asked to rate their average pain intensity in the past 24 hours. The four ratings were then averaged into a composite score representing average daily pain. 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.

In addition to the four telephone interviews described above, participants completed a paper-and-pencil questionnaire on their own at each assessment point. Catastrophizing cognitions were assessed using the 13-item Pain Catastrophizing Scale (PCS; Sullivan, Bishop, & Pivik, 1995), which measures the frequency with which individuals experience catastrophizing cognitions on a 0 (*Not at all*) to 4 (*All the time*) scale. The average score of these ratings was used for analyses. The PCS evidences high levels of internal consistency (Cronbach's  $\alpha = .95$ ; Osman et al., 2000) and adequate test-retest stability over periods ranging from 8 to 12 weeks (Sullivan et al., 1995). The PCS was administered via telephone during one of the four telephone interviews performed at each assessment point (before the initial treatment module and after each of the four treatment modules).

*Secondary outcome variables.* The secondary outcome variables were worst pain intensity and pain interference. Worst pain was assessed using identical procedures similar to those used to assess average daily pain. Participants were asked to rate the intensity of their worst pain in the past 24 hours during four separate telephone interviews at each assessment point. The ratings were averaged into a single composite score representing usual worst pain. As with the ratings of average pain, 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.

Pain interference was assessed using a paper-and-pencil-questionnaire version of a modified version of the Pain Interference Scale of the Brief Pain Inventory (BPI-Interference; Daut, Cleeland, & Flannery, 1983). The BPI-Interference scale asks participants to rate the degree to which pain interferes during the past week with seven daily activities, including general activity, mood, walking, normal work, relations with other people, sleep, and enjoyment of life, with higher scores indicating greater pain interference. We modified one item, interference with walking ability, to "mobility (ability to get around)," given that many individuals with MS are nonambulatory. The BPI-Interference Scale has demonstrated strong reliability and validity across diverse pain conditions, among patients from different cultures, and in individuals with multiple sclerosis (Cleeland & Ryan, 1994; Daut et al., 1983; Osborne et al., 2006).

### *Missing Data*

Complete pre- and postsession pain intensity data were available for 13 of the 15 study participants. Current pain intensity ratings were not administered before and after the CONT treatment sessions for two

participants and after the CR sessions for 1 participant due to clinician error. Analyses testing the effects of each module on pre- to postsession changes in pain intensity, described below, were therefore limited to these 13 participants.

For the remaining measures, 6.7% of the data were found to be missing from 7 of the 15 participants. Data were missing because of (a) incomplete paper assessments and (b) an inability to reach participants over the telephone during the assessment time. Two participants were missing data from two assessment points, and 5 were missing data from one assessment point; no participant was missing data from more than two of the five assessment points. Limiting the analyses to only the 8 participants with complete data would severely limit the power to test the study hypotheses (i.e., it would markedly increase the risk for Type II errors) and also waste the data that were available for the 7 participants who provided most, but not all, of the study data. Thus, data were imputed using next observation carry backward (NOCB; for data missing from the pretreatment assessment) and last observation carry forward (LOCF; for data missing from posttreatment assessments) (Engels & Diehr, 2003). Both NOCB and LOCF have been found to perform acceptably to well on several measures of performance of imputation (Engels & Diehr, 2003). While these imputation strategies could result in a slight underestimation of the effects of the treatment modules (for example, if a treatment module had a real effect, those effects would go unmeasured and therefore undetected for the participant with imputed data for that module, because LOCF would be that variable's score from before the treatment module), it does allow us the use of all available data and allows for at least adequate power for the planned analyses.

### *Data Analysis Plan*

To compare the effects of each treatment module on current pain intensity, we performed a repeated measures analysis of variance, with time (two levels: pre-session and post-session) as a repeated measures variable and treatment module (four levels: CONT, HYP, CR, and CR-HYP) as a between-subjects variable. If the treatment modules had differential effects on pain, as hypothesized, a significant Time  $\times$  Treatment Module interaction should emerge from this analysis, with larger pre- to post-session decreases in pain intensity for the HYP module than for the CR module.

In order to examine the effects of the treatment modules on average daily pain, catastrophizing cognitions, worst daily pain, and pain interference, we next performed a series of repeated measures analyses of variance (ANOVAs), with time (five levels: assessments made at pretreatment and after each of the four treatment modules) and order (two levels: CONT/CR/HYP/CR-HYP vs. CONT/HYP/CR/CR-HYP)

as the independent variables, and the primary (average pain intensity, catastrophizing) and secondary (worst pain intensity, pain interference) outcomes as the dependent variables. Pending no significant order effects (either main effects or interactions involving order), we planned to collapse across both order groups in order to maximize power to test for the effects of each treatment module.

## RESULTS

### *Effects of Treatments on Current Pain Intensity*

Current pain intensity ratings are presented in Table 1. The repeated measures analysis of variance yielded a significant Time  $\times$  Treatment Module interaction,  $F(3, 10) = 9.01$ ,  $p < .01$ , indicating significant differences in pre- to postsession changes in current pain intensity as a function of treatment module. As shown in Table 1, participants experienced significant pre- to postsession decreases in pain intensity for both the HYP,  $F(1, 14) = 19.59$ ,  $p = .001$ , and the CR-HYP,  $F(1, 14) = 16.49$ ,  $p = .001$ , treatment modules. However, the changes in pain intensity from before to after the CONT or CR sessions were very small, and neither was statistically significant.

### *Effects of Treatments on Average Daily Pain Intensity and Catastrophizing Cognitions*

No effects involving treatment order emerged in the ANOVAs testing for the effects of the treatments on the primary outcome variables of average daily pain intensity and catastrophizing cognitions, so the data were collapsed across treatment order to examine the effects associated with each treatment module. In these analyses, significant time effects were found for both outcomes (see Table 2). Univariate analyses demonstrated no significant changes in pain intensity from before

Table 1

*Means and SDs of Current Pain Intensity Ratings Obtained Before and After Each Treatment Module*

Treatment Module	Pre-session M (SD)	Postsession M (SD)
Education Control	3.84 <sup>a</sup> (1.51)	3.68 <sup>a</sup> (1.64)
Hypnosis	3.33 <sup>a</sup> (1.86)	1.77 <sup>b</sup> (1.79)
Cognitive Restructuring	3.49 <sup>a</sup> (1.89)	3.29 <sup>a</sup> (1.92)
Cognitive Restructuring-Hypnosis Hybrid	3.04 <sup>a</sup> (2.16)	1.60 <sup>b</sup> (1.70)

*Note.* Means with different superscripts are significantly ( $p = .001$ ) different from one another.

**Table 2**  
*Means and SDs of Outcome Measures Before Treatment and After Each Treatment Module*

Outcome Variable	Pretreatment		Posteducation Control		Post-Cognitive Restructuring		Posthypnosis Training		Post-Combination Intervention		<i>F</i> ( <i>df</i> ) for Time effect
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<b>Primary outcome variables</b>											
Average pain intensity	4.87 <sup>a</sup>	1.63	4.81 <sup>a</sup>	1.67	4.49 <sup>ab</sup>	2.11	3.96 <sup>b</sup>	1.84	3.29 <sup>c</sup>	1.82	5.79* (4, 10)
Catastrophizing	1.11 <sup>a</sup>	0.92	0.92 <sup>ab</sup>	0.82	0.70 <sup>bcd</sup>	0.84	0.84 <sup>bc</sup>	0.86	0.55 <sup>d</sup>	0.83	3.47 <sup>†</sup> (4, 10)
<b>Secondary outcome variables</b>											
Worst pain intensity	6.46 <sup>a</sup>	1.71	6.20 <sup>ab</sup>	1.51	5.63 <sup>bc</sup>	2.21	5.43 <sup>c</sup>	2.15	4.44 <sup>d</sup>	1.90	6.34** (4, 10)
Pain interference	4.08 <sup>ab</sup>	2.36	4.34 <sup>a</sup>	2.47	3.82 <sup>b</sup>	2.36	3.71 <sup>bc</sup>	2.46	2.99 <sup>c</sup>	2.19	2.06 (4, 10)

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

<sup>†</sup> $p = .05$ . \* $p < .05$ . \*\* $p < .01$ .

treatment to after in either the CONT or the CR modules. However, average pain intensity significantly decreased from before to after the HYP condition (and was lower after HYP condition than the CONT condition). Moreover, average daily pain intensity was significantly lower after the CR–HYP module than before treatment or after *any* of the other treatment modules. The level of catastrophizing after the CR and the HYP conditions was significantly lower than before treatment, but not significantly lower than after the CONT condition. Catastrophizing after the CR–HYP condition was significantly lower than it was after any of the other treatment modules.

#### *Effects of Treatment Modules on Worst Pain Intensity and Pain Interference*

The patterns of findings for the secondary outcome variables were similar to those of the primary outcome variables of pain intensity and catastrophizing; although a significant time effect emerged only for worst pain intensity. The lowest levels of worst pain intensity and pain interference were reported after the CR–HYP treatment module, and at this time point they were significantly lower than they were prior to treatment or after any of the other treatment modules. Levels of pain interference after the CR–HYP module were also significantly lower than they were before treatment and after the CONT and CR modules (but not HYP module). Both worst pain intensity and pain interference were lower after HYP than they were before treatment or after CONT or CR. These differences reached statistical significance when comparing HYP to CONT and HYP to before treatment for worst pain intensity, and when comparing HYP to CONT for pain interference (see Table 2).

## DISCUSSION

This pilot study tested whether HYP would have a stronger impact on pain intensity compared to CR, and whether CR impacted catastrophic cognitions more than HYP. Additionally, we were interested in whether a combination of these two treatments would lead to additional benefits on both pain intensity and catastrophizing. Limited support emerged for both of the study hypotheses; although the support for the hypothesized greater effects of HYP (compared to CR) on pain intensity was stronger than the support for the hypothesized greater effects of CR (compared to HYP) on catastrophizing. Consistent with the first hypothesis, a hypnosis treatment that focused on suggestions for pain reduction and relief resulted in much larger decreases in current (pre- to postsession) pain than a cognitive restructuring treatment that focused on altering maladaptive cognitions (in particular, catastrophizing cognitions). Also, average daily pain intensity, assessed during the week following each treatment module, was lower after

HYP module than after CR module, with pain intensity after HYP being significantly lower than it was before treatment or after the control treatment. However, support for the first study hypothesis is somewhat limited, because the levels of average daily pain intensity following the HYP and CR treatment modules were not statistically significantly different from each other.

Support for the second study hypothesis is even more limited. Although the level of catastrophizing after CR was lower than it was after HYP, this difference was not statistically significant. In fact, catastrophizing after *both* the CR and HYP modules were significantly lower than pretreatment levels. This suggests the possibility that hypnosis treatment that focuses on reducing pain intensity might also have some effect on catastrophizing, perhaps by increasing hope or a sense of control over pain, making it difficult to demonstrate a greater effect of CR, relative to HYP, on catastrophizing cognitions.

Although a significant effect of CR on pain intensity was not observed in our study, research supports the possibility that CR interventions alone might reduce pain intensity in some individuals with chronic pain (Ehde & Jensen, 2004). However, the effects of CR on pain intensity have been hypothesized to be indirect, possibly occurring via changes in activity in the prefrontal cortex (presumably where information about the meaning of pain is processed; see Jensen, 2010). These changes then influence activity in other areas of the cortical pain matrix via the connections between the prefrontal cortex and these other areas (e.g., the anterior cingulate cortex, where information about the emotional aspects of pain is thought to be processed; the primary and secondary sensory cortices, where information about the sensory aspects of pain are thought to be processed; and the insular cortex, where information about the homeostatic state of the physical body is thought to be processed). The effects of hypnosis on the sensory components of pain, however, may be more direct, as hypnosis has been demonstrated to have a strong influence on pain intensity as well as the central nervous system structures that underlie the experience of pain (see Hofbauer, Rainville, Duncan, & Bushnell, 2001; Rainville, Duncan, Price, Carrier, & Bushnell, 1997). The findings from this study, which indicate a larger effect on pain intensity for hypnosis compared with CR, are consistent with the view that hypnosis has a more direct and specific effect on pain intensity than CR does.

On the other hand, the new treatment module developed for this study, the CR–HYP treatment module, showed benefits on all of the outcome variables over and above either CR or HYP alone, including on the measure of catastrophizing. Although the goal of the CR–HYP module was to reduce the frequency of catastrophizing cognitions and increase the frequency of reassuring ones in the context of hypnosis, an added benefit of this treatment on *both* pain intensity (both

average and worst pain intensity) and catastrophizing cognitions was observed. In fact, the most improvement in all outcome variables was observed following this treatment module. Although the repeated-measures design of this pilot study makes it difficult to ascribe the added benefits observed following the CR–HYP condition to that condition alone (it is possible, for example, that the benefits observed may have been due to the beneficial effects of either CR or HYP, or both, continuing over time), the findings raise the intriguing possibility that a hypnotic intervention that targets maladaptive cognitions may be more effective than cognitive therapy without hypnosis, or hypnosis that does not address cognitions. This possibility is consistent with the observation that hypnosis can enhance the efficacy of CBT interventions (see Kirsch, Montgomery, & Sapirstein, 1995) and also provides preliminary empirical support for the benefits of these treatments as described and used by a growing number of clinicians (cf. Alladin, 2006, 2008; Yapko, 2001, 2006).

Although the findings from this study are intriguing, they must be considered preliminary due to a number of important limitations. First, the low number of subjects limits the power to be able to detect significant treatment effects, as well as the overall reliability of the findings. Significant findings for the effects of CR on catastrophizing, for example, may have emerged had there been a larger number of subjects in the study. Second, complete data were not available for all study participants, and some of the data needed to be imputed in order to perform analyses using all of the subjects who participated. However, most of the data (93.3%) were not imputed, and the imputation procedures used were more likely to decrease than increase any treatment effects found. Third, although there was an education control condition in the study, and some benefits of the active treatment modules were found relative to this condition (pain interference for CR, average and worst pain intensity and pain interference for HYP, and all four outcome variables for CR–HYP), there was not a condition in which participants received *only* education; after the education control module, all participants went on to receive each of the three treatment modules. Thus, the study design used did not adequately control for the effects of time or the cumulative or synergistic benefits of the interventions over time. Regression to the mean, for example, could have contributed to the beneficial effects observed after each module, in particular the CR–HYP module, which was provided last.

A fourth limitation, as already discussed, is that the treatment modules were quite brief, lasting only four sessions each. The decision to provide only four sessions of each treatment was made, in part, because providing the more standard 8 to 10 sessions of each module (resulting in 32 to 40 sessions total, lasting 8 to 10 months if the sessions were scheduled on a weekly basis) would not have been practical in a clinical



trial. Nevertheless, it is possible, even likely, that greater benefits for some of the treatment modules might have emerged if more sessions of each had been provided. At the same time, the low number of treatment sessions can be considered a strength; in that benefits of HYP and HYP–CR were seen even after very few treatment sessions.

Finally, it is possible that the treatments may have had some synergistic effects. For example, some of the specific reassuring and adaptive thoughts that were suggested during hypnosis during the CR–HYP intervention were developed during the CR intervention module. The CR treatment, therefore, may have contributed to the benefits seen following the CR–HYP module.

Despite the study's limitations, the findings contribute to our understanding of the relative effects of hypnosis and cognitive restructuring and suggest some avenues of future work. Specifically, the findings demonstrate a greater impact of hypnotic analgesia than CR on pain intensity, supporting both (a) different mechanisms of action on pain intensity for each treatment and (b) a need, perhaps, to offer hypnotic analgesia to patients who report high levels of pain intensity as a primary concern or when reductions in perceived pain intensity is a treatment goal. Also, the findings provide some initial support for the potential benefits of an intervention that combines CR and HYP and raise the intriguing possibility that such a treatment might be more effective than either alone. Future research examining in greater detail the benefits of a full course of this treatment, perhaps as compared to a full course of traditional CR, is indicated. Although we believe that the findings in this study are not unique to MS-related pain, future research should also consider comparing cognitive restructuring and hypnotic interventions not only in individuals with MS but also in individuals with other types of chronic pain.

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### **Effekte von Selbsthypnose-Training und kognitiver Umstrukturierung auf die Schmerzintensität und die Katastrophisierung bei Menschen mit Multipler Sklerose und chronischen Schmerzen**

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**Abstract:** Fünfzehn Erwachsenen mit multipler Sklerose wurden insgesamt 16 Sitzungen einer Behandlung bei chronischen Schmerzen angeboten, welche in 4 Sitzungen mit jeweils 4 unterschiedlichen Behandlungsmodulen unterteilt war: Eine (1) Edukations-Kontroll Intervention, (2) ein Selbst-Hypnose Training (HYP), (3) die kognitive Umstrukturierung (CR) und (4) eine kombinierte Intervention aus Hypnose und kognitiver Umstrukturierung (CR-HYP). Die Ergebnisse dieser Studie stützten die These eines größeren positiven Effekts der HYP (im Verhältnis zur CR) auf die durchschnittliche Schmerzintensität. Bei der CR-HYP Behandlung zeigten sich stärkere positive Effekte als bei einer reinen CR oder dem

reinen HYP. Zukünftige Forschungen sollten daher die Wirksamkeit von Intervention, die CR und HYP miteinander verbinden, weiter untersuchen.

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**Les effets de la formation en autohypnose et en restructuration cognitive sur l'intensité de la douleur quotidienne et sur la dramatisation chez des personnes souffrant de sclérose en plaques et de douleur chronique**

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**Résumé:** Quinze adultes souffrant de sclérose en plaques ont suivi 16 séances de traitement contre la douleur chronique incluant 4 séances, chacune comportant 4 modules : 1) une intervention en contrôle de sensibilisation; 2) une formation en autohypnose (HYP); 3) une restructuration cognitive (RC); et 4) une intervention combinée d'hypnose et de restructuration cognitive (RC-HYP). Les résultats viennent confirmer les effets bénéfiques supérieurs de l'HYP, par rapport au RC, sur la douleur d'intensité moyenne. Le traitement RC-HYP semble avoir donné des effets bénéfiques supérieurs à ceux de la RC et de l'HYP, pris individuellement. D'autres recherches portant sur l'efficacité d'une intervention combinant la RC et l'HYP sont par conséquent recommandées.

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**Efectos del entrenamiento en autohipnosis y la reestructuración cognitiva en la intensidad de dolor diario y en la tendencia a catastrofizar en individuos con esclerosis múltiple y dolor crónico**

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**Resumen:** Quince adultos con esclerosis múltiple recibieron un tratamiento de 16 sesiones para el dolor crónico que incluía 4 módulos de 4 sesiones cada uno: (1) una intervención educativa de control; (2) entrenamiento en autohipnosis (HIP); (3) reestructuración cognitiva (RC); y (4) una intervención combinada de hipnosis con reestructuración cognitiva (RC-HIP). Los resultados apuntan hacia un mayor beneficio de los efectos de HIP, relativa a RC, en el promedio de intensidad de dolor. El tratamiento RC-HIP mostró efectos beneficiosos mayores que los efectos de RC y HIP por sí mismos. Se evidencia la importancia de desarrollar investigaciones que examinen la eficacia de intervenciones que combinen RC y HIP.

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