Hypnosis and Clinical Pain

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Hypnosis has been demonstrated to reduce analogue pain, and studies on the mechanisms of laboratory pain reduction have provided useful applications to clinical populations. Studies showing central nervous system activity during hypnotic procedures offer preliminary information concerning possible physiological mechanisms of hypnotic analgesia. Randomized controlled studies with clinical populations indicate that hypnosis has a reliable and significant impact on acute procedural pain and chronic pain conditions. Methodological issues of this body of research are discussed, as are methods to better integrate hypnosis into comprehensive pain treatment.

After varying in popularity for the past century, interest in hypnosis has more recently been on the upswing. Evidence for a greater recent interest in hypnosis in psychology and health care is demonstrated in two trends in the literature. First, there has been an increased focus on hypnosis as interest in alternative, cost-saving therapies has grown. Although the notion that hypnosis is an alternative therapy can be disputed (Crasilneck, Stirman, & Wilson, 1955), recent evidence suggests that it can have an effective and cost-saving role in medicine. For example, Lang et al. (2000) demonstrated substantial cost savings in the operating room with hypnotic procedures. A second source of evidence for a resurgence of interest in hypnosis is the increasing presence of brain and neuroimaging studies of hypnosis. Studies of this nature have increased both in number and sophistication, as evidenced by Rainville, Duncan, Price, Carrier, and Bushnell’s (1997) report on brain activity in response to hypnotic analgesia in Science.

Clinical pain is a problem that causes substantial suffering (Melzack, 1990) as well as billions of dollars in costs to society in areas such as health care and unemployment (Turk & Okifuji, 1998). Numerous studies have demonstrated the efficacy of hypnotic analgesia for reducing pain in the laboratory setting (E. R. Hilgard & Hilgard, 1975), and many case reports (e.g. J. Barber, 1977; B. Finer & Graf, 1968) have indicated significant reductions in clinical pain. However, relatively few randomized clinical studies on hypnotic analgesia have been published, and the extant reviews of this literature, although making important contributions to the understanding of hypnotic analgesia, are limited. For example, J. Holroyd (1996) published a review on the use of clinical hypnosis for pain that included theoretical discussion of modulation, management, and hypnotizability, but her work included only a small sample of the randomized controlled studies available.

Chaves’s writings have questioned the uncritical acceptance of some of the more dramatic claims that have been made about hypnosis over the past 2 centuries (Chaves, 1994; Chaves & Dworkin, 1997). He has also championed a cognitive-behavioral theoretical explanation for hypnotic analgesia and challenged many assumptions that are common to the field (Chaves, 1993). Although the writings of J. Holroyd (1996), Chaves, and others have raised many important hypotheses concerning hypnotic analgesia, none has included a systematic review of controlled trials of this treatment. In a recent meta-analysis, Montgomery, Duhamel, and Redd (2000) calculated 41 effect sizes from 18 published studies including hypnosis for pain control in both the laboratory and clinical settings. Eight of the 18 studies reviewed by Montgomery and his colleagues included patient populations—the majority of effect sizes came from studies of experimentally induced pain. Their findings indicate that hypnosis provided substantial pain relief for 75% of the populations studied. Montgomery et al. also concluded that the majority of the population (excluding those scoring in the low hypnotic suggestibility range) should obtain at least some benefit from hypnotic analgesia.

In conducting the present review, we sought to build on this previous body of research in a number of ways. Montgomery et al.’s (2000) meta-analysis looked at the hypnotic analgesia studies in aggregate and demonstrated that hypnosis reduces pain in most people under both clinical and experimental settings. Our review focuses primarily on the randomized, controlled clinical studies.

For the purposes of this review, we used Kihlstrom’s (1985) definition of hypnosis as “a social interaction in which one person, designated the subject, responds to suggestions offered by another person, designated the hypnotist, for experiences involving alterations in perception, memory, and voluntary action” (p. 385). This definition is sufficiently broad to incorporate those studies which purport to examine the effects of hypnotic analgesia as well as specific enough to include a primary component of hypnosis, that is, suggestion. We specifically avoided studies that examined interventions that were not defined as hypnosis by the investigators even though they might have included suggestions (e.g., relaxation...
and biofeedback training often includes verbal suggestions for relaxation; “autogenic” training often includes verbal suggestions for comfort and pain-competitive experiences and sensations; imagery or distraction interventions often include suggestions for becoming absorbed in either external stimuli or internally generated images and sensations) unless these interventions were a control condition for a hypnotic intervention or were included as part of the hypnotic intervention and labeled as such by the investigator. The analysis of relaxation training, autogenic training, or imagery studies is beyond the scope of this review, particularly because there is not yet consensus that these interventions fit into the realm of hypnosis. In this review, we also examine the studies along such parameters as the type of pain treated (e.g., acute vs. chronic), study design, and the nature of the control group. In critically examining the studies in this area, we hope to determine the utility of hypnosis in clinical settings as well as the circumstances in which it seems to be most effective.

The article begins with a brief summary of the research on the effects of hypnosis on induced pain in the laboratory setting and theoretical explanations for hypnotic analgesia. The bulk of the review focuses on the controlled trials of hypnotic analgesia for clinical pain problems, including both acute (mostly procedural) pain and chronic pain. We end with a discussion of how hypnosis and hypnotic analgesia may be more effectively applied to chronic pain problems.

Laboratory Studies of Hypnotic Analgesia

Although there are important differences between pain induced in the laboratory in otherwise healthy volunteers and those associated with clinical conditions, analogue studies can provide an important theoretical foundation for understanding hypnotic analgesia. It is useful to discuss the findings of such analogue studies in terms of the general hypnotic theory that drove the investigator’s work. For example, E. R. Hilgard and Hilgard (1975) described a number of studies that showed an association between standard measures of hypnotizability and response to hypnotic analgesia (e.g., Greene & Reyher, 1972). From this perspective, E. R. Hilgard and Hilgard’s seminal work can be viewed in terms of the trait theory of hypnotizability that they espoused at that time (M. B. Evans & Paul, 1970; Greene & Reyher, 1972). Specifically, through their work and that of subsequent investigators, hypnotic suggestibility has been demonstrated to be a measurable construct that is highly stable in subjects even over a period of many years (i.e., .80–.90 test–retest correlations after 10 years; E. R. Hilgard & Hilgard, 1975). This body of research supports the view that there is great individual variability in responsiveness to hypnotic suggestions.

The trait theory of hypnosis has spawned numerous laboratory studies demonstrating an association between analgesia and hypnotic suggestibility. E. R. Hilgard and others have demonstrated that reduction in cold pressor pain (R. Freeman, Barabasz, Barabasz, & Warner, 2000; E. R. Hilgard, 1969; Miller, Barabasz, & Barabasz, 1991) and ischemic muscle pain perception (E. R. Hilgard & Morgan, 1975; Knox, Morgan, & Hilgard, 1974) are both related to suggestibility as measured by standardized scales. McGlashan, Evans, and Orne (1969) also demonstrated an interaction between suggestibility and pain control, whereas those high in suggestibility show analgesia in response to hypnosis but not to placebo, and those low in suggestibility show the same (minimal) response to hypnosis as they do to a placebo. This study was consistent with E. R. Hilgard and Hilgard’s (1975) assertion that hypnotic analgesia is not solely a function of placebo analgesia and that different mechanisms underlie responses to placebos and hypnotic analgesia (see also Stern, Brown, Ulett, & Sletten, 1977). M. B. Evans and Paul (1970) reported that suggestibility was such an important variable that waking suggestions for laboratory pain relief given without a hypnotic induction were as successful as those given within the context of an induction for subjects with high suggestibility scores. As mentioned above, Montgomery et al. (2000) recently reported a meta-analysis of the effects of hypnosis on pain. Consistent with the earlier findings of E. R. Hilgard and colleagues, they found that the effect size of hypnotic analgesia in the laboratory was associated with suggestibility across studies; subjects who scored high on measures of suggestibility during experimental pain paradigms (e.g., cold pressor tasks, painful heat stimuli) across a wide variety of settings tended to demonstrate larger responses to analgesia suggestions than subjects who scored low.

A second line of laboratory pain studies were conducted within the realm of social–cognitive views of hypnosis (T. X. Barber, Spanos, & Chaves, 1974; Chaves, 1989; Chaves & Barber, 1976; Spanos & Chaves, 1989a, 1989b, 1989c). Social–cognitive models include theories of hypnosis that suggest that the operative variables in hypnosis include contextual cues in the social environment, patient and subject expectancies, demand characteristics of the setting or situation, and role enactment (Kirsch & Lynn, 1995). Consistent with this view, experimental hypnotic analgesia has been found to be associated with contextual variables (Spanos, Kennedy, & Gwynn, 1984), instructional set (Spanos & Katsanis, 1989), and compliance (Spanos, Perlini, Patrick, Bell, & Gwynn, 1990). According to such social–cognitive models, neither hypnotic induction nor the existence of an altered state of consciousness are necessary for hypnotic responding, including responses to suggestions for pain relief (Chaves, 1993). Hypnotic analgesia is thought to reduce pain instead through cognitive–behavioral mechanisms, in which changes in cognitions are thought to alter the affective states associated with pain (Chaves, 1993). This conceptualization is consistent with the plethora of evidence that cognitive–behavioral interventions reduce both acute (Tan, 1982) and chronic clinical pain (Bradley, 1996; Holzman, Turk, & Kerns, 1986).

Theoretical approaches that maintain that hypnosis represents a unique or special cognitive process distinct from normal day-to-day cognitive processes have generated a different series of laboratory pain studies. Two such approaches are the neodissociative (E. R. Hilgard & Hilgard, 1975) and, more recently, “dissociated control” views (Bowers & LeBaron, 1986; E. R. Hilgard & Hilgard, 1975). The neodissociative model, originally proposed by E. R. Hilgard and Hilgard (1975), regards hypnosis as a state in which one or more forms of consciousness is split off from the rest.
of mental processing. Although the neodissociative model is a general one used to describe multiple hypnotic phenomena, it was the work of E. R. Hilgard and Hilgard on pain control that largely fueled this theoretical approach. Earlier studies consistent with the neodissociation theory suggested that voluntary responses to induced pain, such as verbal reports of intensity, showed reduction with hypnosis, whereas involuntary indicators (e.g., heart rate) did not always change (T. X. Barber & Hahn, 1962; E. R. Hilgard, 1967, 1969; Shor, 1962; Sutcliffe, 1961). Such findings were also central to E. R. Hilgard and Morgan’s (1975) hidden observer concept—that a part of consciousness can be split off from executive cognitive control and can respond to hypnotic suggestion.

The more recent dissociated control theory stresses the perceived automaticity of response under hypnosis. Bowers’s (1992) dissociated control theory differs somewhat from neodissociation theory in that the former views dissociation as a process of keeping cognitive processes out of consciousness through amnesia or other means. Bowers and his colleagues maintained that subsystems of control in the brain can be activated directly rather than through higher level executive control. For example, Hargadon, Bowers, and Woody (1995) reported that consciously evoked pain strategies were not necessary for subjects to experience a reduction in laboratory induced pain. Similarly, Eastwood, Gaskovski, and Bowers (1998) reported that analgesia in the laboratory involved cognitive mechanisms that were effortlessly engaged. In other words, the strategies subjects used to reduce pain were evoked automatically without any type of conscious, thought-out strategy (Bowers, 1990, 1992). A number of investigators (Barabasz, 1982; Barabasz & Barabasz, 1989; Freeman et al., 2000; Miller et al., 1991; J. T. Smith, Barabasz, & Barabasz, 1996) have reported laboratory pain findings consistent with the theories of E. R. Hilgard and Hilgard (1975) or Bowers (1992).

More recent theorists have suggested that attempting to explain the effects of hypnosis solely in terms of one school of thought presents distinctions that are too arbitrary (Kihlstrom, 1992) and that, at the same time, seeming disparate theoretical orientations about hypnosis have a surprising degree of commonality in many cases (Kirsch & Lynn, 1995). However, the findings from these studies that were originally designed to test different theories of hypnosis raise important hypotheses concerning the conditions under which pain control might be optimized in the clinical situation. For example, studies supporting a trait model of hypnotic suggestibility indicate that highly suggestible patients would be more likely to respond to suggestions for analgesia. As we discuss later, there are several studies that support an association between suggestibility and clinical hypnotic analgesia (Harmon, Hynan, & Tyre, 1990; J. T. Smith et al., 1996; ter Kuile, Spinheiro, Linsen, Zitman, Van Dyck, & Rooymans, 1994). The findings from studies testing social–cognitive models suggest that, because the patient’s expectations for pain relief is a critical variable, treatment effects can be maximized by capitalizing on this element of the social interaction. Such theoretical work also suggests that identifying the patient’s cognitive style and his or her thoughts about pain and then targeting hypnotic suggestions to alter these cognitions should facilitate hypnotic analgesia (Chaves, 1993). Supporting the potential benefit of suggestions that target cognitions in hypnotic analgesia are studies in which subjects have been shown to engage in self-generated cognitive strategies to reduce pain even in the absence of specific suggestions for this (Chaves & Barber, 1974; Chaves & Brown, 1987). Furthermore, Chaves (1989) has pointed out that “catastrophizing” subjects tend to amplify the negative effects of pain. Whereas social–cognitive models might indicate that patients obtain pain relief by concentrating on their thoughts and restructuring them, dissociated control models are more useful in explaining those instances in which hypnotic pain relief seems to come effortlessly to patients. Subjects or patients that appear to respond easily to the hypnotist’s suggestions, often perhaps with amnesia for the experience, would be showing the types of behaviors consistent with this model (Patterson, 2001).

Physiological Correlates of Laboratory Pain Reduction

Hypnosis researchers have long sought specific physiological indicators of the hypnotic state. Much of the early research in this area was fueled by investigators seeking to confirm that the identification of a specific physiological indicator of hypnosis would lend support to the view that hypnosis is a state of consciousness distinct from other states, such as waking or sleep (Dixon & Laurence, 1992). Although some findings from this research have been helpful to determine what hypnosis is not (e.g., cortical activity during hypnosis is unlike cortical activity during sleep; Dynes, 1947), no physiological indicator has been identified that consistently shows characteristics unique to hypnosis. However, some of this research has identified interesting and consistent physiological correlates of hypnotic analgesia. The physiological responses to hypnotic analgesia that have been studied include sympathetic responses (heart rate and blood pressure), electrocortical activity (including the assessment of brain wave patterns at various sites and cortical evoked potentials), possible hypnotic analgesia-related release of endorphins, and regional brain blood flow.

Sympathetic Responding

Some of the first physiological responses to be studied in hypnosis research were sympathetic in nature such as heart rate and galvanic skin responses. However, although decreases in heart rate and blood pressure are sometimes found with hypnosis (De Pascalis & Perrone, 1996; E. R. Hilgard & Morgan, 1975; Lenox, 1970), more often involuntary sympathetic responses to pain are not altered by hypnotic analgesia (T. X. Barber & Hahn, 1962; E. R. Hilgard, 1967, 1969; Shor, 1962; Sutcliffe, 1961; but see Rainville, Carrier, Hofbauer, Bushnell, & Duncan, 1999, for evidence suggesting a possible link between heart rate and pain unpleasantness, or the affective component of pain). Because physiological responses to painful stimuli may be less influenced by subject bias than self-report, some might conclude from the lack of consistent effect on heart rate and blood pressure that hypnosis does not affect actual experienced pain but only a person’s willingness to report that pain. However, as E. R. Hilgard and Hilgard (1975) made clear, the effects of hypnosis on heart rate and blood pressure only speak to the effects of hypnosis on a subset of physiological responses to pain; they say nothing about the effects of hypnosis on pain experience.

Endogenous Opioid and Acupuncture Studies

Given the ability of humans to modulate pain experience through endogenous opioids (Melzack & Wall, 1973), it would be
reasonable to test whether hypnotic analgesia might operate by influencing endogenous opioid levels. This hypothesis has been tested in at least two studies in which the opioid antagonist naloxone was introduced after hypnotic analgesia was initiated (J. Barber & Mayer, 1977; Goldstein & Hilgard, 1975). In both studies, naloxone failed to reverse the effects of hypnotic analgesia. These findings suggest that endogenous opioids may not be responsible for hypnotic analgesia. However, with only two studies, it may be premature to rule out a role for endogenous opioids in hypnotic analgesia. Research has also shown that response to hypnosis does not correlate with response to acupuncture (Knox, Gekoski, Shum, & McLaughlin, 1981; Knox, Handfield-Jones, & Shum, 1979; Knox & Shum, 1977), suggesting that the underlying mechanisms for these two forms of analgesia may be different.

**Evoked Potential Studies**

The findings from electrocortical studies have shown some specific physiological correlates of hypnotic analgesia. For example, the late evoked potential (roughly 300–400 ms after the stimulation), measured at the scalp, has been shown to be associated with the level of reported pain intensity and, like perceived pain intensity, is influenced by cognitive factors such as suggestion and degree to which the stimuli are expected (Chen, Chapman, & Harkins, 1979; Stowell, 1984). A number of studies have shown reductions in late somatosensory potentials evoked by nociceptive stimuli after hypnosis (Arendt-Nielsen, Zachariae, & Bjerring, 1990; Barabasz & Lonsdale, 1983; Crawford et al., 1998; Danziger et al., 1998; De Pascalis, Magurano, & Bellusci, 1999; Halliday & Mason, 1964; Meier, Klucken, Soyka, & Bromm, 1993; Meszaros, Banyai, & Greguss, 1980; D. Spiegel, Bierre, & Rootenberg, 1989; Zachariae & Bjerring, 1994). Thus, these studies support an effect of hypnotic analgesia on a physiological response that is both (a) linked to perceived pain intensity and (b) not under conscious control. Unfortunately, however, these studies do not identify the specific physiological substrates involved in hypnotic analgesia. Also, these studies on evoked potentials, indeed many studies on hypnotic analgesia, do not disentangle the influence of suggestion from the hypnotic context—it is possible that these same effects on evoked potential could be obtained with analgesia suggestions alone (e.g., not only when suggestions are made after an induction or in a situation when the suggestions are not labeled as hypnosis).

**Electroencephalogram (EEG) Studies**

Surface EEG recordings made during hypnotic analgesia have also yielded some interesting findings. Crawford (1990) assessed EEG correlates of cold pressor pain under conditions of waking and hypnosis in persons with high versus low hypnotic suggestibility scores. She found significantly greater theta activity (5.5–7.5 Hz) among those subjects with high suggestibility scores than among those with low scores during the hypnotic analgesia condition, especially in the anterior temporal region. Although those with low scores showed little hemispheric differences during the experimental conditions, the highly suggestible subjects showed greater left hemisphere dominance during the pain condition and a reversal in hemispheric dominance during hypnotic analgesia (see also De Pascalis & Perrone, 1996). Crawford (1994) has maintained that persons who are highly suggestible demonstrate greater cognitive flexibility and abilities to shift from left to right anterior functioning than do those who are less suggestible. She concluded that hypnosis may operate via attention filtering and that the fronto-limbic system is central to this process. However, the fact that suggestions for focused analgesia are as effective (or more effective) than dissociative imagery to reduce pain (De Pascalis, Magurano, Bellusci, & Chen, 2001) poses a problem for the interpretation that hypnotic analgesia operates solely via attention mechanisms and suggests that the specific mechanisms involved may depend on the specific type of suggestion given.

**Brain Imaging Studies**

Although EEG studies of evoked potentials and brain wave patterns do not provide information about the specific neuroanatomical sites at which the modulation of pain experience occurs (Price & Barrell, 2000), studies using positron emission tomography (PET) can provide a more precise analysis of these physiological substrates. Rainville et al. (1997) used PET scans to study brain activity of subjects exposed to hot water before, during, and after hypnotically induced analgesia for the unpleasantness, but not the intensity, of a noxious stimulus. Their results indicated that hypnosis-related changes in the affective dimension of pain were associated with changes in cortical limbic regional activity (anterior cingulate cortical area 24) but not with changes in the primary somatosensory cortex. In a second study using PET methodology, Hofbauer, Rainville, Duncan, and Bushnell (2001) demonstrated that suggestions for sensory analgesia resulted, at least in part, in a reduction in activity in the somatosensory cortex. In review, Price and Barrell (2000) concluded that hypnotic analgesia can produce both an inhibition of afferent nociceptive signals arriving at the somatosensory cortex and a modulation of pain affect by producing changes in the limbic system (e.g., anterior cingulate cortex; see also Kroptov, 1997).

**Possible Inhibition at the Spinal Cord Level**

There is evidence that hypnotic analgesia may also operate, at least to some degree, through inhibition at the level of the spinal cord. Support for this mechanism comes from a variety of research studies that demonstrate hypnotically induced reductions in skin reflex on the arm (Hernandez-Peon, Ditthorn, Borlone, & Davidovich, 1960), nerve response in the jaw (Sharav & Tal, 1989), and muscle response in the ankle (J. Holroyd, 1996; Kiernan, Dane, Phillips, & Price, 1995). The study by Kiernan and colleagues (1995) has received particular attention because it demonstrates that suggestions for analgesia were correlated with the spinal nociceptive (R-III) reflex, a response that has little to do with higher order central nervous system processing. More recently, Danziger and colleagues (1998) found two distinct patterns of R-III reflex associated with hypnotic analgesia. Using a methodology similar to that of Kiernan et al., these investigators found that 11 subjects showed strong inhibition, and 7 showed strong facilitation of the R-III reflex with hypnosis. Although the reasons for such differences in response are not easily explained, they do indicate that highly suggestive individuals show a marked change in R-III reflex when given hypnotic analgesia suggestions. As pointed out by J. Holroyd (1996), hypnotic effects on nervous system inhibition at the level of the spinal cord have also been
demonstrated by alterations in galvanic skin response (Gruzelier, Allison, & Conway, 1988; West, Niell, & Hardy, 1952). Unfortunately, however, these are limited by the absence of control groups with nonhypnotized patients, as are many studies on the physiological effects of hypnosis. This limits the inferences that can be drawn about the effects of hypnosis (vs. suggestions made outside of a hypnotic context) on physiological responses to hypnotic analgesia.

**Sensory Versus Affective Pain Effects**

Several recent studies have focused on whether hypnotic analgesia has a greater effect on sensory or affective components of pain. It is understandable that there has been speculation that affective components of pain, which are thought to have a greater cognitive–evaluative component, might be more responsive to hypnosis than sensory components, which are presumably more closely associated with nociceptive input. In one of the earlier studies that examined this question, Price, Harkins, and Baker (1987) reported that affective components of pain showed a greater reduction with hypnosis than did sensory ones. However, another study by Price and Barber (1987), showed that both components could show a reduction, and that the amount of change depended on the nature of suggestion. Further support for the hypothesis that the effects of hypnotic analgesia on pain sensation versus pain affect depend on the specific suggestions given comes from Rainville et al.’s (1999) brain imaging work, which shows that brain activity also varies as a function of the nature of analgesic suggestion. In short, the recent evidence does not support the hypothesis that hypnotic analgesia necessarily impacts affective pain to a greater extent than sensory pain. However, this research has demonstrated the importance of the wording of the analgesic suggestions and that subjects can respond to suggestions that are targeted toward distinct elements of pain.

In summary, the research on neurophysiological correlates of hypnotic analgesia suggests that highly suggestive subjects show different patterns of cortical responding than do those who score low on measures of suggestibility. Research also shows that individuals engaged in successful hypnotic analgesia invoke physiological inhibitory processes in the brain. Suggestions for sensory reductions in pain show corresponding changes in activity in the somatosensory cortex, whereas suggestions for affective pain reduction are reflected in the part of the brain that corresponds to processing emotional information. Another line of research suggests that successful inhibition of pain through hypnosis may also occur, at least in part, through descending (spinal) inhibitory mechanisms. However, the lack of nonhypnotic control conditions in much of this research prohibits conclusions regarding the impact of hypnosis versus nonhypnotic suggestions on physiological responding. Perhaps what can best be concluded from this body of research is that neurophysiological changes are associated with hypnotic analgesia in receptive subjects and that multiple physiological mechanisms appear to play a role in the pain reduction associated with hypnotic suggestions for pain relief.

**Anecdotal and Clinical Reports**

There are many anecdotal reports and case studies that support the use of hypnosis for a wide variety of clinical pain conditions. Perhaps the most time honored of these are those of Esdaile (1957), a Scottish physician, who reported on 345 major operations performed in India in the nineteenth century with hypnosis (termed *mesmerism* at that time) as the sole anesthetic. Similarly, E. R. Hilgard and Hilgard (1975) listed at least 14 different types of surgeries (cited by multiple investigators) for which hypnosis was used as the sole anesthetic, including appendectomies, gastrectomies, tumor excisions, and vaginal hysterectomies. Rausch (1980) reported undergoing a cholecystectomy using self-hypnosis and being able to walk consciously back to his room immediately after the procedure. Burn injuries are another source of severe pain for which there are multiple reports of good patient response to hypnosis (Patterson, Questad, & Boltwood, 1987; Gilboa, Borenstein, Seidman, & Tsur, 1990), and B. L. Finer and Nylen (1961) reported bringing a patient through several extensive burn surgeries with hypnosis as the sole anesthetic. Other case studies have described a wide variety of problems that have responded to hypnosis, including pain associated with dental work (J. Barber, 1977; J. Barber & Mayer, 1977; Hartland, 1971), cancer (J. R. Hilgard & LeBaron, 1984), reflex sympathetic dystrophy (Gainer, 1992), acquired amputation (Chaves, 1986; Siegel, 1979), childbirth (Haanen et al., 1991), spinal cord injury (M. Jensen & Barber, 2000), sickle cell anemia (Dinges et al., 1997), arthritis (Appel, 1992; Crasilneck, 1995), temporomandibular joint disorder (Crasilneck, 1995; Simon & Lewis, 2000), multiple sclerosis (Dane, 1996; Sutcher, 1997), causalgia (B. Finer & Graf, 1968), lupus erythematosus (S. J. Smith & Balaban, 1983), postsurgical pain (Mauer, Burnett, Ouellette, Ironson, & Dandes, 1999), and unanesthetized fracture reduction (Iserson, 1999). Other types of pain problems reported to respond to hypnotic analgesia include low back pain (Crasilneck, 1979, 1995), headaches (Crasilneck, 1995; Spinhoven, 1988), and mixed chronic pain (F. J. Evans, 1989; Jack, 1999; Sacerdote, 1978). Even this long list of pain etiologies is by no means exhaustive. In short, hypnosis has been reported to be useful for virtually every clinical pain problem imaginable.

However, the many limitations of case reports are well known, including potential subjective bias from the clinician and patient, potential spontaneous remission, placebo effects, and selective reporting of only the most successful cases (Campbell & Stanley, 1963). All of these drawbacks severely limit any conclusions that may be drawn from the anecdotal reports and case studies of hypnotic analgesia. Even the frequently cited findings of Esdaile (1957) and the hypnotic analgesia–surgery literature have been called into question (T. X. Barber et al., 1974; Chaves, 1993; Dingwall, 1967; Spanos, 1986). Furthermore, Chaves and Dworkin (1997) have argued that patients can also demonstrate extraordinary pain control without hypnosis and that contentions that such patients show no pain under hypnosis are often false.

A number of other additional methodological problems are specific to published hypnosis case reports, including the failure to include validated measures of pain, hypnotic suggestibility, and levels of pain medication used by the patients. Another shortcoming is that consecutive patients often are not subjected to hypnotic treatment; patients often appear to be selectively treated and reported on without a description of the decision rules used to select the cases. Because of these limitations, the best and only conclusion we can make from these clinical case studies is that there appear to be some individuals with clinical pain problems who...
may benefit from hypnotic analgesia. Unfortunately, however, the available case study evidence does not allow us to determine whether this group of responders represents an exception or the norm.

Contrasted Clinical Studies

Acute Pain

As mentioned above, randomized controlled studies have largely been absent from the clinical hypnosis literature, although a welcome increase has occurred over the past 2 decades. A difficulty in this literature is that the nature of the pain problems treated are rarely discussed in detail. Of particular concern, the important distinction between acute and chronic pain is seldom mentioned. When the research is considered with this distinction in mind, it becomes clear that the two types of pain represent dramatically different treatment issues.

Acute pain may be defined as that which occurs in response to tissue damage (Melzack & Wall, 1973; Williams, 1999). In most of the reports in this area, hypnosis is applied to acute pain associated with a medical procedure. Table 1 summarizes the findings, and Table 2 describes the hypnotic interventions that were used in the 19 controlled studies that have been published on the effects of hypnosis on acute pain, organized by the type of pain. We have indicated in Table 1 whether the study included an adult or child sample, whether a measure of hypnotic suggestibility was included, the nature of the control group (or comparison groups), whether the subjects were randomly assigned to treatment condition, the outcome dimensions assessed, and the findings concerning any differences found between the hypnosis and control conditions.

Through MEDLINE and PsycINFO searches using the key words hypnotic analgesia, hypnosis, and pain, and through a careful review of the citations of previous review articles and the articles themselves, we were able to identify the published studies listed in Tables 1 and 2 that examined the effects of hypnosis on acute pain, including pain from invasive medical procedures (included in this category is one study [Syrjala, Cummings, & Donaldson, 1992] that examined the effects of hypnosis for painful oral mucositis, which is one of the results of chemotheraphy and total body irradiation done in preparation for marrow transplantation in some persons with cancer), burn care, and childbirth.

Invasive medical procedure pain. Weinstein and Au (1991) compared 16 patients who received presurgery hypnosis and then underwent angioplasty with 16 patients who received standard care. The hypnotic intervention was based on a modification of the induction reported by J. Barber (1977). Relative to the control group, patients in the hypnosis group showed a (statistically insignificant, p = .10) 25% increase in the time that they allowed the cardiologist to keep the balloon catheter inflated during the surgery and a statistically significant reduction in the opioid analgesics required during the procedure. The hypnosis group also showed a significant decrease in catecholamine blood levels relative to the control group. However, the experimental group did not demonstrate changes in other physiological variables measured including blood pressure or pulse.

Lambert (1996) randomly assigned 52 children (matched for age, sex, and diagnosis) to either an experimental group that received both hypnosis and guided imagery or a control group in which each child spent an equal amount of time discussing the surgery and topics related to the child’s interests. The experimental treatment involved a single 30-min session 1 week before the surgery that included suggestions for relaxation based on an image selected by the child followed by suggestions for positive surgical outcomes and minimal pain. The therapist was not present during the surgery. The experimental group rated their pain as significantly lower than the control group did. However, although anxiety scores decreased in the experimental group and increased in the control group, mean postsurgery anxiety scores did not differ between groups. The experimental group also showed shorter hospital stays, but the groups did not differ on length of surgery, anesethesia, or time in postanesthesia care.

Faymonville et al. (1997) randomly assigned a group of patients undergoing elective plastic surgery while sedated to receive either hypnosis (n = 31) or a stress-reducing physiological technique (n = 25) by the treating anesthesiologist. According to the authors, “a hypnotic state was… induced using eye fixation, muscle relaxation, and permissive and indirect suggestions. The exact words and details of the induction technique... depended on the anesthesiologist’s observation of patient behavior” (Faymonville et al., 1997, p. 362). However, the authors stated that the word hypnosis was never used to describe that treatment to the study participants.

Patients in the control group received continuous stress reduction strategies including “deep breathing and relaxation... positive emotional induction... and cognitive coping strategies (imaginative transformation of sensation or imaginative inattention)” (Faymonville et al., 1997, p. 362). Patients in the hypnosis group required significantly less analgesia (alfentanil) and sedation (midazolam), reported better perioperative pain and anxiety relief, higher levels of satisfaction, greater perceived control, lower blood pressure, heart rate, and respiratory rate, and lower postoperative nausea and vomiting. Surgeons of patients in the experimental condition also reported observing higher levels of satisfaction in patients than surgeons of patients in the control condition. Despite the positive effects of the hypnosis intervention reported, there are several aspects of this study that make the interpretation of the findings difficult. First, because the hypnosis intervention was never defined as such to the patients, this intervention differs from most others tested in which the intervention was presented as hypnosis. It is not entirely clear what effect, if any, labeling the intervention as hypnosis might have had on the outcome. In addition, the differences between the hypnosis and the stress-reducing intervention are not entirely clear in this study. Patients in both conditions appear to have been given suggestions (although the specific suggestions given to each group did differ). Finally, the findings are further complicated by the fact that the treating anesthesiologist provided all interventions and was aware of the study conditions.

Lang and her colleagues have reported two studies on hypnosis for invasive medical procedures. In the first (Lang, Joyce, Spiegel, Hamilton, & Lee, 1996), 16 patients were randomized to an experimental group that received “combined elements of relaxation training and guided imagery for induction of a self-hypnotic process” (p. 109). Relative to 14 patients in a standard treatment control, hypnosis patients used less pain medication, reported less maximal pain (but not average pain), and showed more physiologic stability during the procedures (primarily diagnostic arterio-
<table>
<thead>
<tr>
<th>Study and type of acute pain</th>
<th>Hypnotizability assessed?</th>
<th>N</th>
<th>Randomized?</th>
<th>Control conditions</th>
<th>Adult or child?</th>
<th>Outcome dimensions</th>
<th>Findings</th>
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<tr>
<td>Zeltzer &amp; LeBaron (1982)</td>
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<td>Outcome dimensions</td>
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<td>Patient-rated pain in the second stage</td>
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<td>Yes; Stanford Hypnotic Clinical Scale for Adults</td>
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<td>Weinstein &amp; Au (1991)</td>
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<th>Adult or child?</th>
<th>Outcome dimensions</th>
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<td>SC</td>
<td>Adult</td>
<td>Self-administration of analgesics H &gt; SC</td>
<td>BP increase H = SC</td>
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<td>Heart rate increase H = SC</td>
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<td>Patient-rated level of control H &gt; ES</td>
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<td>Hemodynamic stability H &gt; (AC = SC)</td>
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Note. H = hypnosis alone; PBRS-R = Procedural Behavior Rating Scale—Revised; PBCL = Procedural Behavior Checklist; MMPI = Minnesota Multiphasic Personality Inventory; MPQ = McGill Pain Questionnaire; BAI = Beck Anxiety Inventory; SpO2 = Oxygen saturation; STAIC = State-Trait Anxiety Inventory for Children.
Table 2
*Description of Hypnotic Treatment: Acute and Procedural Pain Studies*

<table>
<thead>
<tr>
<th>Study</th>
<th>Manualized?</th>
<th>Described as hypnosis to subjects?</th>
<th>Audiotaped?</th>
<th>Description of intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katz et al. (1987)</td>
<td>No</td>
<td>Unclear</td>
<td>No</td>
<td>Two sessions prior to the procedures plus 20-min sessions immediately before each of three procedures. Sessions began with eye fixation, which was followed by suggestions for relaxation, pain reduction, reframing pain, distraction, positive affect, and mastery. Posthypnotic suggestions for practicing and reentering hypnosis with a cue from the therapist during the procedure. Therapist was present during procedures, but interactions were limited to the provision of the cue (hand on shoulder) and brief encouraging statements.</td>
</tr>
<tr>
<td>Kuttner (1988)</td>
<td>No</td>
<td>Unclear</td>
<td>No</td>
<td>Suggestions to become involved with a favorite story that incorporated reinterpretations of the procedural noxious experience. Therapist present and provided intervention during procedure.</td>
</tr>
<tr>
<td>Liossi &amp; Hatira (1999)</td>
<td>No</td>
<td>Unclear</td>
<td>No</td>
<td>Suggestions for relaxation, well-being, self-efficacy, and comfort followed by suggestions for numbness, topical anesthesia, local anesthesia, and glove anesthesia transferred to the low back were finished with posthypnotic suggestions that the hypnotic experience would be repeated during the procedure. Therapist was present during procedure, but interactions were limited to cue for subject to use the skills learned and to brief verbal encouragements.</td>
</tr>
<tr>
<td>Wakeman &amp; Kaplan (1978)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Procedures varied. They typically included initial eye fixation and eye roll followed by suggestions for relaxation and other suggestions tailored for individual subjects such as analgesia, anesthesia, dissociation, and reduction of anxiety. Subjects were instructed to use self-hypnosis when therapist was not present. Therapist was present during procedures and other regularly scheduled times until “self-hypnosis was mastered” (p. 4)</td>
</tr>
<tr>
<td>Patterson et al. (1989)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>J. Barber’s (1977) rapid induction analgesia, which includes suggestions for relaxation, imagining 20 stairs for deepening, and posthypnotic suggestions for comfort, relaxation, analgesia, and anesthesia, was used during the procedures. Intervention was performed 10 min to 3 hr prior to wound debridement, and therapist was not present during procedure.</td>
</tr>
<tr>
<td>Patterson et al. (1992)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>J. Barber’s (1977) rapid induction analgesia was used during the procedures. Intervention was performed prior to wound debridement, and therapist was not present during procedure.</td>
</tr>
<tr>
<td>Everett et al. (1993)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>J. Barber’s (1977) rapid induction analgesia was used during the procedures. Intervention was performed prior to wound debridement, and therapist was not present during procedure.</td>
</tr>
<tr>
<td>Patterson &amp; Ptacek (1997)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>J. Barber’s (1977) rapid induction analgesia was used during the procedures. Intervention was performed prior to wound debridement, and therapist was not present during procedure.</td>
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<td>Wright &amp; Drummond (2000)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>J. Barber’s (1977) rapid induction analgesia was used during the procedures. Intervention was performed immediately prior to wound debridement, and therapist was not present during procedure.</td>
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<tr>
<td>Davidson (1962)</td>
<td>No</td>
<td>Unclear</td>
<td>No</td>
<td>Six sessions of group training, which included eye fixation followed by suggestions for relaxation, normality of pregnancy and labor, diminished awareness of pain and need for analgesics, ability to produce anesthesia of the perineum at birth, and satisfaction and pleasure after childbirth. Therapist was sometimes present to provide intervention during labor.</td>
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<td>R. M. Freeman et al. (1986)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Weekly group sessions prior to labor providing suggestions for relaxation, pain relief, and transfer of warmth from hand to abdomen. Subjects were also seen individually weekly from 32 weeks after gestation until birth. Therapist was not present during labor.</td>
</tr>
<tr>
<td>Harmon et al. (1990)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Suggestions for relaxation, heaviness, deep breathing, backward counting, enjoyment of childbirth delivery, and numbness. Sessions were taped, and subjects were asked to listen to tapes daily prior to delivery (average number of listenings = 23).</td>
</tr>
<tr>
<td>Weinstein &amp; Au (1991)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Suggestions for relaxation followed by posthypnotic suggestions for relaxation during angioplasty the next morning. Suggestions were based on J. Barber’s (1977) scripted induction. Clinician available to assist with relaxation during procedure if necessary.</td>
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</table>
grams). Differences in anxiety ratings were not statistically significant, nor were differences in blood pressure or heart rate increases during the procedures. In addition, treatment benefits did not correlate with suggestibility as measured by the Hypnotic Induction Profile (H. Spiegel & Spiegel, 1978). A limitation of the study is that the clinicians were aware of the patients’ group assignments.

More recently, Lang et al. (2000) randomly assigned 241 patients undergoing cutaneous vascular and renal procedures to standard care (n = 79), structured attention (n = 80), or self-hypnotic relaxation (n = 82). Structured attention involved eight key components described in a treatment manual cited by the authors, and hypnosis involved these key components plus a hypnotic induction followed by suggestions for the patients to imagine themselves in a safe and pleasant environment during the procedure. Procedure times were shorter and hemodynamic stability was greater in the hypnosis group relative to the attention control group. Both the attention and hypnosis treatments showed less drug use than did the standard care condition. This study is remarkable because it is one of the few studies in this area that used manualized treatment. Moreover, fidelity of the treatment intervention was established through a video coding system, and the multiple outcome measures included one that demonstrated cost savings (i.e., length of procedures).

As part of preparation for bone marrow transplantation, patients receive supralethal doses of chemotherapy often followed by supralethal doses of total body irradiation. This treatment often results in severe nausea and vomiting and pain from oral mucositis that can last from several days to 3 weeks. Syrjala et al. (1992) reported a randomized controlled study of the effects of hypnosis and a cognitive–behavioral intervention, relative to two control conditions, on these symptoms during 20 days after chemotherapy and irradiation. The cognitive–behavioral intervention included cognitive restructuring, information, goal development, and exploration of the meaning of the disease. Hypnosis involved relaxation and suggestions for pain control. Rather than standardized inductions, interventions were tailored to the needs of the patient and were then placed on audiotapes for the patient’s benefit. Patients were asked to listen to the hypnosis daily for 20 days following chemotherapy and irradiation. The control conditions were therapist contact and standard care (although through randomization, the standard care group had a preponderance of men, making the investigators choose to eliminate this condition from most analyses because of the potential biasing impact this might have). Patients in the hypnosis group reported significantly less pain following chemotherapy and irradiation than patients in the attention control or cognitive–behavioral therapy groups. However, no significant differences emerged between the conditions in nausea, presence of emesis, or medication use.

**Burn care pain.** Burn-related pain is similar in many ways to that associated with invasive medical procedures. Typical care of burn wounds often involves daily dressing changes and wound debridements, that is, procedures that clearly produce significant nociception. As mentioned earlier, there are numerous case reports of the utility of hypnosis for burn pain (Patterson et al., 1987), starting with Crasilneck et al.’s (1955) report in the *Journal of the American Medical Association*. Of additional note are Ewin’s (1983, 1984, 1986) reports that the early application of hypnosis in the emergency room can not only prevent the development of burn-related pain but can also facilitate wound healing. However, these findings must be considered preliminary as they were case reports and did not include control conditions. We were able to identify six controlled trials of hypnosis for burn wound care pain in the literature.

Wakeman and Kaplan (1978) reported that patients with burns who received hypnosis used significantly less analgesic drugs over a 24-hr period than did a group of patients randomly assigned to receive attention only from a psychologist. Treatment included a variety of therapist and audio-induced hypnotic techniques and suggestions were given for hypnoanalgesia, hypnoanesthesia or
dissociation, and reduction of anxiety and fear. The control group received verbally supportive time from the therapist without interventions for pain control. In this study, the therapist was present during the wound care procedures.

In a series of studies, using the rapid induction analgesia technique reported in detail by J. Barber (1977), Patterson and colleagues have reported that hypnosis reduces patient reports of severe pain. In the first study, Patterson, Questad, and DeLateur (1989) found that patients who received hypnotic analgesia prior to their wound care (the therapist was not present during wound care) who also reported high initial levels of burn pain at baseline showed a significant drop in pain ratings relative to a control group. This initial study did not involve random assignment to treatment condition, but in a subsequent study by Patterson, Everett, Burns, and Marvin (1992), patients randomized to a hypnosis group reported a greater drop in pain scores than did a control group of patients who only received attention from the psychologist. It is interesting to note that Patterson et al. (1992) found this significant effect even though the control intervention was labeled and presented as hypnosis. However, Everett, Patterson, Burns, Montgomery, and Heimbach (1993) did not find that posthypnotic suggestions for comfort, relaxation, and analgesia resulted in reduced pain ratings when compared with an attention control group or to the tranquilizer lorazepam in a subsequent study. One possible explanation for the inconsistent findings is that the initial pain ratings may not have been high enough in the sample of burn patients examined in the Everett et al. study. This explanation has been supported in a subsequent replication, in which Patterson and Ptacek (1997) found that posthypnotic suggestions had a large effect, but only for patients with high levels of initial pain. We should note that Wright and Drummond (2000) showed positive effects of the rapid induction analgesia technique (J. Barber, 1977) and posthypnotic suggestions for analgesia during burn wound care, even when initial levels of pain were not considered. These findings with burn wound care pain led the authors to suspect that these motivation (to avoid high levels of pain), increased compliance (from a natural dependence of patients on trauma health care personnel through the course of intensive and acute hospital care), and dissociation (from the acute stress associated with the burn injury) all might play a role in the apparent impact of hypnosis among patients with burns (Patterson, Adcock, & Bombardier, 1997). Unfortunately, none of the six studies on burn wound care included measures of suggestibility and therefore do not allow for examination of the association between this variable and outcome, a particular weakness in this series of investigations.

**Labor pain.** Labor pain represents another type of acute pain that is a candidate for hypnotic intervention. Moya and James (1960) and Flowers, Littlejohn, and Wells (1960) reported earlier studies on the clinical benefits of hypnosis for pregnancy. Davidson (1962) also published an earlier successful trial of hypnosis for labor, although this study did not feature a randomized assignment to study groups. Mothers in this study that received six sessions of posthypnotic suggestions for relaxation and pain relief during labor prior to giving birth showed shorter Stage 1 labor, reported that analgesia was more effective, reported less labor pain, and indicated that labor was a more pleasant experience.

R. M. Freeman, Macaulay, Eve, Chamberlain, and Bhat (1986) compared 29 women who received hypnosis before labor with 36 women who received standard care (both groups participated in weekly prenatal classes). Hypnosis involved suggestions for relaxation, pain relief and for transferring anesthesia in the hand to the abdomen. The Stanford Hypnotic Clinical Scale for Adults (Morgan & Hilgard, 1978–1979a) was administered to patients in the hypnosis group. No differences were found in analgesia intake, pain relief during labor, or mode of delivery, and the hypnosis group actually had longer duration of labor (by 2.7 hr, on average). Patients with good to moderate hypnotic suggestibility reported that hypnosis reduced their anxiety and helped them cope with the labor, though specific statistical analyses comparing high and low suggestible patients were not reported.

Harmon et al. (1990) divided 60 pregnant women into two groups on the basis of high and low hypnotic suggestibility scores, who then received six sessions of childbirth education and skill mastery. Half of the women were randomly assigned to receive a hypnotic induction and suggestions as part of this session; the other half received breathing and relaxation exercises. The hypnosis treatment involved a number of suggestions for relaxation and analgesia, is carefully described in the article, and was audi-taped for the patients to listen to daily prior to delivery. Control subjects listened to a commercial prebirth relaxation tape that had several suggestions that may have been similar to hypnosis. The benefits of hypnosis, relative to childbirth education alone, were demonstrated across several variables. The women that received hypnosis had shorter Stage 1 labor, used less pain medication, gave birth to children with higher Apgar scores, and had a higher rate of spontaneous deliveries than did women in the control group. Women receiving hypnosis also reported lower labor pain across a number of scales of the McGill Pain Questionnaire (Melzack & Perry, 1975). In examining the data, it appears that all women in the hypnosis group benefited to some degree but that the women with high hypnotic suggestibility scores showed more benefit in both treatment conditions across all of the outcome domains than did women with low hypnotic suggestibility scores. The women with high suggestibility scores who received hypnosis also showed lower depression scores after birth than did the women with low suggestibility scores in the hypnosis group or women in the control group. An interesting feature of this study is that the participating women were subjected to an ischemic pain task during the training sessions leading up to childbirth. High suggestible women reported lower ischemic pain than did those with low suggestibility scores, and women in the hypnosis group reported lower pain than those in the control group.

**Bone marrow aspiration pain.** Another type of acute pain that has shown good response to hypnosis in controlled studies is pain associated with bone marrow aspirations. At least five studies have shown positive findings with such procedures (Katz, Kellerman, & Ellenberg, 1987; Kuttner, 1988; Liossi & Hatira, 1999; Syrjala et al., 1992; Zeltzer & LeBaron, 1982). Zeltzer and LeBaron (1982) randomly assigned 33 children (ages 6–17 years) undergoing either lumbar punctures or bone marrow aspirations to either hypnosis or control (deep breathing, distraction, and practice ses-sions) groups. Hypnosis, as described by the investigators, in-volved helping children become increasingly involved in interest-ing and pleasant images. Interventions were unique to each child and involved story telling, fantasy, imagery, and deep breathing. Both groups demonstrated a reduction in pain, but lower ratings of pain were reported in the hypnosis group, and hypnosis subjects
reported a reduction of anxiety that was not seen in control subjects.

Katz et al. (1987) randomly assigned 36 children (ages 6–11 years) undergoing lymphoblastic leukemia related bone marrow aspirations to hypnosis or play comparison groups. Children in the hypnosis condition received relaxation—imagery and suggestions for pain control and distraction—and posthypnotic suggestions for reentering hypnosis following a cue from the therapist. Although the therapist was present during the procedure, interactions during the procedure were limited to the provision of the cue (hand on shoulder) and brief encouraging statements. The control condition involved nondirected play for an equivalent amount of time spent in the hypnosis condition. Children in both the hypnosis and play groups showed decreases in self-reports of pain and fear relative to baseline. Hypnosis was not found to be superior to the play group comparison intervention.

Kuttner (1988) randomly assigned children (ages 3–6 years) with leukemia to three groups: a control group (standard medical intervention including information, reassurance and support; n = 8), a distraction treatment (pop up books, bubbles; n = 8), and a hypnotic intervention in which the child’s favorite story became the vehicle to create pleasant imaginative involvement (n = 9). The therapist was present to provide both the distraction and experimental (hypnosis) interventions during the procedure. On a behavioral checklist completed by external observers, the hypnotic intervention had an immediate impact on observed distress, pain and anxiety; however, this effect was not found in the patient self-report measures.

Liossi and Hatira (1999) compared hypnosis, cognitive–behavioral coping skills training, and standard treatment (lidocaine injection alone) in 30 children (ages 5–15 years) undergoing bone marrow aspirations. Children in both the hypnosis and cognitive–behavioral interventions reported less pain and pain-related anxiety than did controls, relative to their own baseline. Children in the cognitive–behavioral group showed more behavioral distress and reported more anxiety than the hypnosis group, but the authors concluded that both treatments are effective in preparing pediatric patients for bone marrow aspirations. Suggestibility scores were obtained with the Stanford Hypnotic Clinical Scale for Children (Morgan & Hilgard, 1978–1979b). Hypnotic suggestibility showed a strong association with outcome among the hypnosis group (rs = .69, .63, and .60 for pain, anxiety, and observed distress, respectively) but were less consistent in the cognitive–behavioral therapy group (rs = .54, .13, and .36) and the control group (rs = .30, .00, and .06).

**Summary of acute pain studies.** In summary, there is a substantial amount of anecdotal evidence and there are several well-designed controlled studies to support the efficacy and use of hypnosis with acute pain problems. Most studies in this area have focused on pain produced by invasive medical procedures (e.g., surgery, burn wound care pain, bone marrow aspirations) or childbirth. Across these domains, out of 17 studies that included self-report measures of pain, 8 studies showed hypnosis to be more effective than no treatment, standard care, or an attention control condition. Three studies showed hypnosis to be no better than such control conditions (in one of these, significant effects for hypnosis were found among subjects scoring high in suggestibility), and one study showed mixed results (this study showed significant effects for one pain measure but not another). Out of eight comparisons with other viable treatments (e.g., cognitive–behavioral therapy, relaxation training, distraction, emotional support), hypnosis was shown to be superior four times. In no case was any condition superior to hypnosis for reducing patient-rated pain severity. In short, treatments described as hypnosis by investigators, and often those involving suggestions for focused attention and for pain relief, are at least as, and about half the time even more, effective than other treatments for reducing the pain associated with invasive medical procedures in both children and adults.

There are a number of important variables that could potentially play a role in the beneficial effects of hypnosis found in these studies. Acute procedural pain is time limited and generally predictable in onset and duration. Both the transient and predictable nature of acute procedural pain makes it possible for hypnotic interventions and skills to be taught to patients in a preparatory manner. In several studies the beneficial effects of hypnosis were obtained even when the therapist was not present during the medical procedure. It is also possible that the severity of acute pain in many of these procedures may contribute to the motivation of patients to participate in treatment, which may, in turn, actually increase the effectiveness of hypnotic analgesia (Patterson & Ptacek, 1997). What is yet to be determined is whether such benefits as reductions in pain and anxiety and improved medical status are worth the cost of clinician time needed to train patients in the use of hypnosis (i.e., whether other studies will demonstrate the cost-effectiveness seen in Lang et al., 2000).

**Chronic Pain**

Whereas acute pain is that associated with a specific injury and is expected to be short lived, resolving once the injury heals, chronic pain may be defined as pain that persists beyond the healing time needed to recover from an injury (often operationalized as pain that has lasted for more than 3 months) or as pain associated with an ongoing chronic disease or degenerative process (Chapman, Nakamura, & Flores, 1999). The location, pattern, and description of acute pain usually provides information about an underlying acute disease process, and the description of the pain often matches well with what is known about the cause of the pain (Gatchel & Epker, 1999). Chronic pain, on the other hand, usually communicates little about an underlying disease process. Moreover, psychosocial factors, such as patient cognitions, patient pain–coping responses, and social and environmental factors come to play an increasingly important role in the experience and expression of chronic pain over time (Fordyce, 1976; Turk & Flor, 1999). Treatments known to have strong effects on acute pain, such as rest and immobility or opioid analgesics, may have limited usefulness for persons with chronic pain conditions (Fordyce, 1976).

These important differences between acute and chronic pain may have significant implications concerning the manner in which effective hypnotic analgesia is provided, as well as the duration of effect of hypnotic treatments. For example, the likelihood that cognitive factors such as beliefs and cognitive coping responses play a larger role in the experience of chronic pain than the experience of acute pain could make the effects of a psychological intervention such as hypnosis more pronounced. On the other hand, the fact that chronic pain tends to be generally less severe than procedural pain suggests the possibility that persons with chronic pain may feel less urgency or motivation to put effort into...
<table>
<thead>
<tr>
<th>Study and type of chronic pain problem</th>
<th>Hypnotizability assessed?</th>
<th>N</th>
<th>Randomized?</th>
<th>Control conditions</th>
<th>Adult or child?</th>
<th>Follow-up</th>
<th>Outcome dimensions</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spiegel &amp; Bloom (1983) Cancer-related pain</td>
<td>No</td>
<td>54</td>
<td>Yes</td>
<td>Standard care (SC), support group without hypnosis (SG)</td>
<td>Adult None</td>
<td>Patient-rated pain intensity</td>
<td>H &gt; SG &gt; SC</td>
<td></td>
</tr>
<tr>
<td>Haanen et al. (1991) Fibromyalgia pain</td>
<td>No</td>
<td>40</td>
<td>Yes</td>
<td>Physical therapy (PT)</td>
<td>Adult 3 months</td>
<td>Morning stiffness; Muscle pain; Fatigue; Sleep disturbance; Self-reported global assessment of outcome</td>
<td>H &gt; PT</td>
<td></td>
</tr>
<tr>
<td>Anderson et al. (1975) Headache</td>
<td>No</td>
<td>47</td>
<td>Yes</td>
<td>Medication (M; prochlorperazine)</td>
<td>Adult None</td>
<td>Number of headaches; Self-reported global assessment of outcome</td>
<td>H = PT</td>
<td></td>
</tr>
<tr>
<td>Andreychuk &amp; Skriver (1975) Headache</td>
<td>Yes; Hypnotic Induction Profile</td>
<td>33</td>
<td>Yes</td>
<td>Hand temp biofeedback (HTB), alpha enhancement biofeedback (AEB)</td>
<td>Adult None</td>
<td>Number of Grade 4 headaches; Frequency of being headache free; Headache Index (Daily Headache Duration x Headache Severity)</td>
<td>H = HTB = AEB</td>
<td></td>
</tr>
<tr>
<td>Schlutter et al. (1980) Headache</td>
<td>No</td>
<td>48</td>
<td>Yes</td>
<td>Biofeedback (BF), biofeedback + relaxation (BFR)</td>
<td>Adult 10-14 weeks</td>
<td>Number of headache hours per week; Pain intensity; Pain intensity during submaximum effort tourniquet technique</td>
<td>H = BF = BFR</td>
<td></td>
</tr>
<tr>
<td>Friedman &amp; Taub (1984) Headache</td>
<td>Yes; Stanford Hypnotic Susceptibility Scale, Form A</td>
<td>66</td>
<td>No</td>
<td>H (without thermal suggestion), hypnosis with thermal suggestion (HT), BF, relaxation (R), wait list (WL)</td>
<td>Adult 1 year</td>
<td>Number of headaches; Medication use</td>
<td>(H = HT = BF = R) &gt; WL</td>
<td></td>
</tr>
<tr>
<td>Melis et al. (1991) Headache</td>
<td>Yes, but used for descriptive purposes only; Stanford Hypnotic Clinical Scale for Adults</td>
<td>26</td>
<td>Yes</td>
<td>WL</td>
<td>Adult 4 weeks</td>
<td>Number of headache days per week; Number of headache hours per week; Headache intensity</td>
<td>H &gt; WL</td>
<td></td>
</tr>
<tr>
<td>Spinhoven et al. (1992) Headache</td>
<td>Yes, but used for descriptive purposes only; Stanford Hypnotic Clinical Scale for Adults</td>
<td>56</td>
<td>Yes</td>
<td>Autogenic training (AT), baseline control (BC)</td>
<td>Adult 6 months</td>
<td>Headache intensity; Psychological distress; CSQ; Headache relief</td>
<td>(H = AT) &gt; BC</td>
<td></td>
</tr>
<tr>
<td>Zitman et al. (1992) Headache</td>
<td>No</td>
<td>79</td>
<td>Yes</td>
<td>AT, hypnosis not presented as hypnosis (HN)</td>
<td>Adult 6 months</td>
<td>Headache intensity</td>
<td>H &gt; AT; H = HT; HN = AT</td>
<td></td>
</tr>
</tbody>
</table>

Table 3
Controlled Studies of Chronic Pain Hypnotic Treatment
### Table 3 (continued)

<table>
<thead>
<tr>
<th>Study and type of chronic pain problem</th>
<th>Hypnotizability assessed?</th>
<th>N</th>
<th>Rawipized?</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>Yes (Hypnotizability Study)</td>
<td>46</td>
<td>Yes</td>
<td>Adult 6 months</td>
</tr>
<tr>
<td>von Korff et al. (1991)</td>
<td>Yes (Standard Hypnotic clinical Scale for Adults)</td>
<td>24</td>
<td>Yes</td>
<td>Adult 4.6 months</td>
</tr>
<tr>
<td>Melzack &amp; Perry (1975)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Adult 1 month</td>
</tr>
<tr>
<td>Kibbea (1989)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Adult 1 month</td>
</tr>
</tbody>
</table>

**Outcome dimensions**

- Headache (intensity and duration)
- Medication use
- Sensory pain
- Pain sensitivity
- Pain severity
- MPQ
- Various chronic pain etiologies
- Cancer-related, arthritis pain
- Headache pain
- Self-Rating Depression Scale
- SF-36
- Coping Strategy Questionnaire
- STAI
- HSCL-90
- SCL-90
- SDS
- CSQ
- WLB
- AT
- Headache pain
- Clinical Scale for Adults
- McGill Pain Questionnaire
- SPAQ
- HSCL
- SCL-90
- MPQ
- SCL-90
- SDS
- CSQ
- STAI
- HSCL-90
- SCL-90
- SDS

**Findings**

- H = AT > WL
- H = AT = WL
- H > A
- H = A
- CBT > AC
- CBT = AC

**Note.**

- H = hypnosis alone, DM = (biofeedback + hypnotic suggestions for relaxation, visual imagery techniques, verbal reinforcers, and suggestions for pain reduction) + cigarettes, and self-hypnosis
- CBT = cognitive-behavioral therapy (CBT), attention control (AC)

**Six years later, Malone and Strube (1988) performed a meta-analysis of nonmedical treatments for chronic pain.** Out of 109 published studies, they identified 48 that provided sufficient information to calculate effect size. Fourteen of these studies included hypnosis, with the types of pain problems treated described as mixed group, nonspecific; cancer, headache, back/neck, and lupus. However, only one of these studies of hypnosis provided enough detailed outcome data for Malone and Strube to calculate an effect size and an average percentage of improvement. The mean rate of improvement in this one study was only 13%, which did not compare favorably with that of autogenic training (68%) or of biofeedback-assisted relaxation training (84%). In fact, none of these compared that well with the average 77% improvement rate they found for no-treatment conditions.

Although hypnosis did not fare well in earlier reviews with chronic pain, there were very few randomized controlled studies available at the time these reviews were written from which to base conclusions about the effects of hypnosis on chronic pain. However, a number of controlled trials of hypnosis for chronic pain have been published since these reviews were written. As we describe below, these studies show hypnosis as a potentially helpful treatment for reducing the pain associated with chronic pain conditions.

**Headache pain.** Far more studies have focused on the use of hypnosis for headache than for any other etiology of chronic pain. We identified nine such studies that are listed in Table 3 along with other chronic pain etiologies; the nature of the hypnotic interventions used in these studies are described in Table 4. Andreychuk and Skriver (1975) randomly assigned 33 patients with migraine headaches to groups in which they received biofeedback training for hand warming, alpha enhancement biofeedback, or self-training in hypnosis. Hypnosis treatment lasted 10 weeks and was provided during the weekly sessions through audiotapes that included suggestions for relaxation, visual imagery techniques, verbal reinforcers, and suggestions for pain reduction. Patients were also asked to listen to the tapes outside of the sessions twice every day. Patients in the biofeedback conditions also listened to a tape that included suggestions for relaxation and were asked to listen to this tape twice daily throughout treatment. Outcome was measured with the Headache Index (the product of Daily Headache Dura-
Table 4

<table>
<thead>
<tr>
<th>Study</th>
<th>Length of treatment (no. and length of sessions)</th>
<th>Audirotaped?</th>
<th>Description of intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Spiegel &amp; Bloom (1983)</td>
<td>1 year (5–10 min of hypnosis after weekly 90-min group therapy sessions)</td>
<td>No</td>
<td>Suggestions to “filter the hurt out of the pain” (p. 338) by imagining competing sensations in affected areas.</td>
</tr>
<tr>
<td>Haanen et al. (1991)</td>
<td>3 months (eight 1-hr sessions)</td>
<td>Yes</td>
<td>Suggestions for arm levitation, deepening, ego strengthening, control of muscle pain, relaxation, and improvement of sleep disturbance. Third session was taped, and subjects were asked to listen to tape daily.</td>
</tr>
<tr>
<td>Anderson et al. (1975)</td>
<td>1 year (six or more sessions)</td>
<td>No</td>
<td>Unstandardized trance induction followed by suggestions for ego strengthening, relaxation, and decreased tension and anxiety. Patients asked to give themselves similar suggestions with autohypnosis daily.</td>
</tr>
<tr>
<td>Andreychuk &amp; Skriver (1975)</td>
<td>10 weeks (ten 45-min sessions)</td>
<td>Yes</td>
<td>Listening to a tape (two listenings per session) that included suggestions for relaxation and visual imagery and “direct suggestions for dealing with pain” (p. 177), which included relaxation instructions and verbal reinforcers. Subjects were encouraged to practice twice daily between sessions.</td>
</tr>
<tr>
<td>Schlutter et al. (1980)</td>
<td>4 weeks (four 1-hr sessions)</td>
<td>No</td>
<td>Eye fixation followed by suggestions for relaxation, analgesia or numbness, and visualization of an enjoyable situation.</td>
</tr>
<tr>
<td>Friedman &amp; Taub (1984)</td>
<td>3 weeks (three 1-hr sessions)</td>
<td>No</td>
<td>Induction only or induction plus thermal imagery, which included suggestions for imagery involving placing hands in warm water and experiencing hand warmth. Subjects were asked to practice self-hypnosis daily for 3–5 min.</td>
</tr>
<tr>
<td>Melis et al. (1991)</td>
<td>4 weeks (four 1-hr sessions)</td>
<td>Yes</td>
<td>Eye fixation followed by suggestions for relaxation and the flow off technique (expressing headache as visual image and changing). Each session was taped, and patients were asked to listen to the tape daily between sessions.</td>
</tr>
<tr>
<td>Spinhoven et al. (1992)</td>
<td>8 weeks (four 45-min sessions and three booster sessions at 2, 4, and 6 months after treatment)</td>
<td>Yes</td>
<td>Suggestions for relaxation, imaginative inattention, pain displacement, transformation, and imagining self in the future without pain. In Session 4, a tape was made for self-practice, and subjects were instructed to listen to tape twice daily.</td>
</tr>
<tr>
<td>Zitman et al. (1992)</td>
<td>8 weeks (four 45-min sessions) and three booster sessions at 2, 4, and 6 months after treatment</td>
<td>Yes</td>
<td>Suggestions for relaxation and for imagining self in a future situation in which pain control has been achieved. Subjects were asked to practice with tape twice daily.</td>
</tr>
<tr>
<td>ter Kuile et al. (1994)</td>
<td>7 weeks (seven 1-hr sessions) and then three 1-hr booster sessions at 2, 4, and 6 months after treatment</td>
<td>Yes</td>
<td>Suggestions for relaxation, imaginative, pain displacement, transformation, hypnotic analgesia, and altering maladaptive cognitive responses. The suggestions of the last session were taped, and subjects were asked to listen to tapes twice daily for 15 min.</td>
</tr>
<tr>
<td>Melzack &amp; Perry (1975)</td>
<td>6–12 sessions (2 hr for hypnosis + alpha feedback group, 1–1.5 hr for alpha feedback alone and hypnosis alone groups)</td>
<td>Yes</td>
<td>Taped 20-min suggestions for relaxation, feeling stronger and healthier, having greater alertness and energy, less fatigue, less discouragement, feeling greater tranquility and ability to overcome things that are ordinarily upsetting, being able to think more clearly, to concentrate and remember things, be more calm, less tense, more independent, and less fearful.</td>
</tr>
<tr>
<td>Edelson &amp; Fitzpatrick (1989)</td>
<td>2 weeks (four 1-hr sessions)</td>
<td>No</td>
<td>Hypnosis condition was identical to cognitive–behavioral control condition, except that the hypnotic condition was preceded by a “hypnotic induction”; any specific suggestions made were not described.</td>
</tr>
</tbody>
</table>

Note. None of the studies were manualized.
Schlutter, Golden, and Blume (1980) randomly assigned 48 patients to groups that received hypnosis, electromyograph (EMG) biofeedback alone, or EMG feedback plus progressive relaxation. Patients in the hypnosis condition received four 1-hr sessions over the course of 4 weeks, and hypnosis consisted of eye fixation followed by suggestions for relaxation, analgesia or numbness, and visualization of an enjoyable experience (Greene & Reyher, 1972). Patients in each of the treatment conditions reported similar reductions in number of headache hours per week and average headache pain.

Friedman and Taub (1984) also failed to find differences among treatments including a hypnotic induction-only condition, an induction plus thermal imagery condition, a thermal biofeedback condition (which included the provision of standard autogenic phrases eliciting feelings of warmth), and a relaxation condition in 66 patients with migraines. All treatment groups showed improvements as measured by headache ratings and medication use, relative to wait list controls. It is important to note that subjects with high scores on the Stanford Hypnotic Susceptibility Scale, Form A (Weitzenhoffer & Hilgard, 1959) showed meaningful decrements on outcome variables at the 1-year follow-up, across treatment conditions, when compared with those who scored low on this measure.

Several additional controlled studies on hypnosis with headaches have been published over the past decade with similar results. Melis, Rooimans, Spierings, and Hoogduin (1991) had 26 patients with chronic headaches undergo 4 weeks of baseline observation, and then randomly assigned them either to four weekly 1-hr sessions of hypnotic suggestions supplemented by home practice audiotape or to 4 weeks of no treatment (wait list). The hypnotic intervention was described as including the “flow off” technique (expressing and changing the headache as a visual image) as well as suggestions for moving the pain to other areas of the body. The hypnotic group reported significantly more improvement on number of headaches, headache hours, and headache days than the wait list control group did. Although the investigators used the Stanford Hypnotic Clinical Scale for Adults to describe their sample, they did not report on any association between suggestibility and outcome.

Spinhoven and his colleagues have published a number of randomized studies that indicate that hypnosis is essentially equivalent to autogenic training (in Spinhoven, Linssen, Van Dyck, & Zitman, 1992, autogenic training consisted of suggestions for hand heaviness, hand warming, and coolness of the forehead) in controlling tension headaches. Using 56 patients in a within-subjects, randomized design, they found that both hypnotic and autogenic training improved average headache pain intensity, psychological distress, and headache relief relative to a wait list control group. Hypnosis consisted of four sessions (over the course of 8 weeks) of suggestions for relaxation, imaginative inattention, and pain displacement and transformation. Similarly, ter Kuile et al. (1994) reported that in 146 subjects, hypnosis and autogenic training showed effects on headache duration and intensity over a wait list control but were no different from one another. Subjects who scored high on the Stanford Hypnotic Clinical Scale for Adults showed greater treatment effects posttreatment and at follow-up than did those who scored low, independent of treatment condition. The hypnosis treatment was similar to that used in the Spinhoven et al. study, but it included cognitive–behavioral interventions on maladaptive cognitive responses.

Zitman, Van Dyck, Spinhoven, and Linssen (1992) took 79 patients with headaches and first randomly assigned them to autogenic training or to “future-oriented” hypnosis (FI) that was not labeled as hypnosis. FI treatment largely involved having patients imagine themselves in a future situation in which pain reduction had been achieved. In the second phase, 6 months later, all patients who received either autogenic training or FI in the first phase were offered FI again, except that in this phase FI was “openly presented as a hypnotic technique” (p. 221). All three treatments appeared to be equally effective in reducing Headache Index scores. However, at 6-month follow-up, the FI group practicing what was explicitly labeled as hypnosis showed the greatest improvement on the Headache Index—and this improvement was statistically significantly greater than that reported by the attention control condition. There are at least two plausible explanations for the greater impact of the second hypnosis intervention. First, this higher efficacy may have been due to the fact that at the follow-up to the second phase, these subjects had received twice as much treatment (14 sessions total) as they had at the end of the first phase. Second, it is also possible that explicitly labeling the procedures as hypnosis might have been responsible for the treatment advantage.

The findings for the headache studies in aggregate are consistent with the conclusion of a review performed by Spinhoven (1988), that the effects of hypnotic treatments for headaches do not differ significantly from those of autogenic or relaxation training. K. A. Holroyd and Penzien (1990) reached the same conclusion in a more recent review. The only exception to this is Zitman et al.’s (1992) finding with FI, but this finding might reflect a dose effect (because subjects in this condition received more hypnosis than the subjects in the autogenic treatment condition) or an increased expectancy effect caused by an explicit labeling of the intervention as hypnosis.

It is notable that in those studies that included measures of suggestibility, patients showed more improvement with headache control if they scored high on tests of hypnotic suggestibility, independent of whether they received hypnosis, autogenic training, or relaxation. Along these lines, the many similarities between hypnotic treatment and relaxation interventions, such as autogenic training, are worth noting. In fact, Edmonston (1991) has argued that hypnosis cannot be differentiated from, and in fact may be, a form of deep relaxation. On the other hand, relaxation and autogenic training both often include hypnotic-like suggestions for comfort, focused attention, and changes in perceptions, so perhaps these should be considered variants of hypnotic treatment. To complicate matters further, Spanos and Chaves (1989a, 1989b, 1989c) have long argued that positive responses to suggestions for pain control can be achieved without the induction of a hypnotic state. Studies on the hypnotic control of headache pain therefore raise two important questions: (a) What role does relaxation play in the effects of hypnotic analgesia (particularly given the role of tension in causing many forms of headaches)? and (b) What role do suggestions (i.e., hypnosis) play in the effects of relaxation training?

Chronic pain other than headache. Controlled trials of hypnosis for chronic pain conditions other than headache are few, but do provide some preliminary evidence that hypnosis is effective for reducing pain for a number of chronic pain conditions (see
Tables 3 and 4). We were able to identify four such studies. D. Spiegel and Bloom (1983) examined pain control and other variables in women with chronic cancer pain from breast carcinoma (as opposed to pain from cancer-related medical procedures discussed in the Acute Pain section). Fifty-four women were assigned to either a usual treatment control condition \( (n = 24) \) or to a group receiving usual treatment and weekly group therapy for up to 12 months \( (n = 30) \). The women in group therapy were, in turn, assigned to groups that either did or did not have brief (5–10 min) self-hypnosis as a part of their group therapy treatment (the nature of treatment was based on H. Spiegel & Spiegel, 1978). Both support groups showed improvement in pain control over usual treatment. However, women who received self-hypnosis showed an improvement above and beyond that of other interventions on reduced pain intensity.

One controlled study examined the effects of hypnosis among persons with refractory fibromyalgia (Haanen et al., 1991). Haanen and colleagues randomly assigned patients to this diagnosis to groups that received either eight 1-hr sessions of hypnotherapy (supplemented by a self-hypnosis home practice audiotape) over a 3-month period or 12 to 24 hr of physical therapy (massage and muscle relaxation training) for 12 weeks, with follow-up at 24 weeks. The investigators found larger improvements in the patients who received hypnosis than in the patients who received physical therapy on measures of muscle pain, fatigue, sleep disturbance, and overall assessment of outcome and distress scores. These differences were maintained through the follow-up assessment. Although this study is limited in that the control condition and the hypnosis condition were not equivalent in terms of patient contact and time, the findings are important because they provide one of the few tests of hypnosis in a chronic pain sample other than persons with headaches that used a randomized design.

Two controlled studies have been reported on hypnosis with chronic pain of mixed etiology. Melzack and Perry (1975) examined the effects of hypnosis and alpha biofeedback in 24 patients with a variety of chronic pain problems, including back pain \( (n = 10) \), peripheral nerve injury \( (n = 4) \), cancer \( (n = 3) \), arthritis \( (n = 2) \), amputation \( (n = 2) \), trauma \( (n = 2) \), and “head pain” \( (n = 1) \). Patients were randomly assigned to one of three groups; 12 received 6 to 12 sessions of hypnosis plus alpha training, 6 received hypnosis alone, and 6 received alpha training alone. Pain was assessed just before and just after each treatment session. The authors reported that alpha training had the smallest effect on pain, followed by hypnosis, which had a greater, but not statistically significant, effect on pain reduction. The combination of alpha training and hypnosis, however, had an impressive impact on pain reduction, as measured by scales from the McGill Pain Questionnaire (Melzack & Perry, 1975). Fifty-eight percent of the patients reported a reduction of pain of 33% or greater. The authors acknowledged that their study design could not rule out placebo effects as a possible explanation for the reductions in pain observed because there was not a placebo condition or even a no-treatment condition. Certainly, however, the findings indicate that the further study of the potential additive effects of hypnosis with other treatments for chronic pain is warranted.

Edelson and Fitzpatrick (1989) also looked at patients \( (N = 27) \) with mixed etiologies for pain, with back pain being the most frequent. Patients were randomly assigned to four 1-hr sessions of an attention control (supportive, nondirective discussions), a cognitive–behavioral, or a hypnosis group. The hypnosis group received the same information as the cognitive–behavioral group but after a standard hypnotic induction. The cognitive–behavioral group showed increases in walking and decreases in sitting relative to the control group and the hypnosis group, while the hypnosis group showed improvements in subjective ratings of pain only (McGill Pain Questionnaire total score) relative to the attention control condition.

Five additional investigations deserve mention even though they did not use random assignment to experimental (hypnosis) and control conditions. Using a multiple baseline design, Simon and Lewis (2000) reported that 28 patients with temporal mandibular disorder pain showed improved pain control at 6-month follow-up after receiving six sessions of hypnotic analgesia. This pain had previously been refractory to other treatments. Crasilneck (1995) used hypnosis with 12 patients who had what he described as intractable organic pain. His intervention involved multiple inductions within the same sessions followed by six specific suggestions for pain management, including pain displacement, age regression to a time period prior to the onset of pain, and a reexperiencing of the experience of being pain free, and glove anesthesia. He reported 80%–90% relief of pain at 1-year follow-up. M. Jensen, Barber, Williams-Avery, Flores, and Brown (2001) examined the effects of hypnosis with analgesia suggestions among 22 patients with spinal cord injury-related pain. They found that 86% of their sample reported a decrease in pain following a hypnotic induction and analgesia suggestions relative to prehypnosis pain levels. Dinges et al. (1997) used self-hypnosis as part of a cognitive–behavioral treatment program in an attempt to manage pain from sickle cell disease. Thirty-seven children, adolescents, and adults provided 4 months of baseline data before undergoing the combination of behavioral and self-hypnotic treatment. Findings indicated a substantial decrease in pain-related episodes following treatment. Finally, James, Large, and Beale (1989) evaluated self-hypnosis using a multiple baseline design for 5 patients with chronic pain and who were selected for high scores on hypnotic susceptibility tests. They found variable outcomes, with 2 of the patients reporting significant improvement, 2 reporting little change (although these 2 did find that self-hypnosis was effective on some occasions), and 1 reporting no apparent benefit.

Summary of chronic pain studies. The findings of chronic pain studies parallel, in some ways, those from acute etiologies. Compared with no-treatment, standard care, or attention conditions, hypnotic analgesia procedures result in significantly greater reductions in a variety of measures of pain. However, when hypnosis is compared with other treatments, in particular with other treatments that share many characteristics with hypnosis (e.g., suggestions for relaxation and competing sensations) such as autogenic and relaxation training, hypnosis is less often found to be superior to these alternative treatments. This finding is somewhat in contrast to the several acute pain studies demonstrating the superiority of hypnosis to other treatments. However, in none of these studies has hypnosis been shown to be less effective than any other treatment for reducing pain. Moreover, it is possible that hypnosis may be less time consuming and more efficient than either autogenic or relaxation training. At the very least, the question of relative efficiency of hypnosis, autogenic training, and relaxation training should be investigated in future studies.
Methodological Issues of Hypnotic Analgesia Research

Although the results of this review indicate that hypnotic analgesia results in decreased pain from a variety of acute and chronic pain conditions, several important methodological issues make firm conclusions regarding the efficacy of hypnotic analgesia difficult to make. For example, the numbers of patients in published controlled trials tend to be low, which limits the power to detect statistical differences between treatment conditions. Hypnotic interventions also vary widely from study to study. Moreover, although several studies referred to citations or scripts to describe their experimental intervention, only Lang et al. (2000) described a carefully detailed manualized procedure. There is clearly a need for more randomized clinical trials that include larger samples and standardized hypnotic procedures, particularly in the area of chronic pain (other than that caused by headaches). Three additional key methodological issues that deserve detailed discussion include suggestibility, nonspecific versus specific effects, and practice–dose effects.

Hypnotic Suggestibility

As discussed above, one of the most robust findings in the laboratory pain hypnosis literature has been the association between hypnotic pain reduction and hypnotic suggestibility as measured by hypnotizability scales (R. Freeman et al., 2000; E. R. Hilgard, 1969; E. R. Hilgard & Hilgard, 1975; E. R. Hilgard & Morgan, 1975; Knox et al., 1974; Miller et al., 1991). Moreover, Montgomery et al. (2000) found suggestibility to be an important variable in their meta-analysis of both experimental and clinical studies.

Patterson et al. (1997) have previously suggested that the relationship between suggestibility and pain control may not necessarily generalize well to clinical situations. For example, Gillett and Coe (1984) reported that they found no differences in response to hypnotic analgesia between low and high suggestibility patients undergoing painful dental procedures. In the current review, of the controlled studies we examined, seven assessed the association between suggestibility and outcome—four acute pain studies (R. M. Freeman et al., 1986; Harmon et al., 1990; Lang et al., 1996; Liossi & Hatira, 1999) and three chronic pain studies (Andreychuk & Skriver, 1975; Friedman & Taub, 1984; ter Kuile et al., 1994). Of these, all but one demonstrated a positive association between suggestibility and at least one outcome measure; Lang et al. (1996) was the only exception. In several studies, patients scoring high on tests of hypnotic suggestibility often showed as much benefit from other psychological treatments (autogenic training, relaxation, cognitive–behavioral) as they did from hypnosis (Andreychuk & Skriver, 1975; Friedman & Taub, 1984; Liossi & Hatira, 1999; ter Kuile et al., 1994). High suggestibility was also associated with long-term treatment effects in the one study that examined this (Friedman & Taub, 1984).

Thus, on the basis of the available studies, there does appear to be some association between clinical effect and suggestibility. Moreover, unlike many of the studies in the hypnotic analgesia literature of experimental pain, subjects in these studies were not specifically selected from the high and low ends of hypnotizability scales. Social–cognitive theorists have maintained that little can be concluded about the importance of suggestibility if medium susceptible subjects are not included in experimental designs (Kirsch & Lynn, 1995). The fact that the studies in the current review included subjects representing all ranges of suggestibility argues even more strongly for the potential importance of this variable in predicting analgesic treatment outcome in clinical populations.

Of course, the fact that an association exists between hypnotic suggestibility and treatment outcome does not necessarily mean that only persons with high screening scores should be offered hypnotic analgesia. Just because highly suggestible patients benefit more, on average, than those low on this variable does not mean that patients falling in the medium or low range would never benefit. In their discussion of this issue, Montgomery et al. (2000) showed that although highly suggestible people may obtain the most benefit, persons with medium scores can report pain relief from hypnotic analgesia, and even those with low suggestibility scores showed an effect size greater than zero (albeit the effect size for this group was very close to zero). Montgomery et al. concluded that 75% of the population could obtain “substantial” pain relief from hypnotic analgesia; given that the rates of highly suggestible people in the population is roughly 30% (E. R. Hilgard & Hilgard, 1975), this would certainly indicate that analgesic effects extend well beyond those scoring at the high end of the curve on this variable.

In addition, there is some evidence that people can increase their suggestibility with training and practice. For example, J. Holroyd (1996) has suggested that hypnotic analgesia can be improved through manualized training programs for patients. Similarly, Barabasz (1982) has demonstrated that restrictive environmental stimulation (REST) can increase both suggestibility scores and experimental pain tolerance (to shocks). Barabasz and Barabasz (1989) indeed demonstrated this finding among persons with chronic pain; subjects were able to increase their Stanford Hypnotic Susceptibility Scale scores and tolerance to ischemic pain following REST. It would seem that a primary benefit of research on suggestibility and response to analgesia is that it can be useful to identify patients that can respond readily and can also indicate those that might need additional training or support.

Nonspecific Versus Specific Effects

A second important issue concerning studies of clinical hypnotic analgesia is that of nonspecific effects. Frequently referred to in the literature as placebo effects, the term nonspecific better captures effects common to all treatments but not specific to the treatment being examined (Kazdin, 1979). Ideally, clinical trials not only determine that a treatment is effective relative to no treatment, or to a no-treatment waiting period, but also to a treatment condition designed to control for nonspecific effects. Designing such control conditions for hypnosis treatment is particularly challenging, however, because there are so many components to hypnotic interventions used in the clinical setting. For example, in many of the studies we reviewed, hypnosis included an induction, deepening, and suggestions for pain relief within the context of the induction. Studies in the laboratory have indicated that not all of these components are necessary for pain reduction and other perceptual phenomena (Chaves, 1993), although these findings have not been replicated in clinical pain populations. An ideal study would independently manipulate each of the components of what has traditionally been included in hypnotic treat-
ments and compare these components to a “placebo” condition that controls for therapist time and patient expectancy but might not otherwise be expected to affect pain. A series of such studies would help determine the extent to which an induction, deepening suggestions, or analgesia suggestions are necessary or sufficient for pain reduction, and also help determine the extent to which hypnotic analgesia results in reductions of pain over and above the effects of expectancy and therapist attention.

Along the same lines, the question of whether an intervention is labeled as hypnosis has been brought to the fore in this review. Although all of the investigators clearly viewed the interventions tested in the studies reviewed as hypnosis, and it is likely that in most cases the interventions were presented as such to the study participants, it was often not specifically made clear that the patients studied were informed that they were undergoing hypnosis; this was particularly the case in studies with children. Moreover, in two of the studies, the investigators viewed their intervention as hypnosis, but specifically did not label it as such (Faymonville et al., 1997; Zitman et al., 1992). This brings up the important definitional issue of whether a patient who unknowingly undergoes an induction has received hypnosis, and whether such labeling influences the outcome of treatment. Ideally, future studies would include conditions in which the patient is told or not told the intervention is hypnosis, in order to disentangle the effects of this variable on treatment efficacy.

Although no clinical study on hypnotic analgesia published to date has systematically manipulated the label of the procedure tested (as hypnosis or not), some of the studies reviewed in this article did manipulate other components of the interventions, and so shed some preliminary light on the contributions of each to outcome. For example, several studies indicated that hypnotic pain control was significantly more effective than a condition in which patients received an equivalent amount of attention from the psychologist (Patterson et al., 1992; Patterson & Ptacek, 1997; Syrjala et al., 1992; Wakeman & Kaplan, 1978). In addition, a few studies included a control group in which the attention from the psychologist was labeled as hypnosis (Everett et al., 1993; Patterson & Ptacek, 1997; Patterson et al., 1989; Zitman et al., 1992), and most of these found the hypnotic intervention to be superior to the control intervention that had been labeled as hypnosis for patients. Several studies included control with relaxation and deep breathing (Davidson, 1962; Katz et al., 1987; Zeltzer & LeBaron, 1982) and the majority of studies on headache pain have compared hypnosis with treatment groups that have used autogenic training or progressive relaxation (see Table 3).

Not only is it important to seek to control for and test the relative contributions of the components of hypnosis but that studies determine the relative efficacy of various specific hypnotic suggestions. Tables 2 and 4, for example, list the many different hypnotic inductions and suggestions given in the studies reviewed in this article. Given the research that has demonstrated differential neurophysiological responding to different specific suggestions (e.g., Rainville et al., 1999), much more attention needs to be paid to the specific suggestions that are provided during treatment. It is very likely that some suggestions will be more effective for reducing pain experience than others. At a minimum, authors must provide clear descriptions of the specific suggestions made to the participants in any clinical trial. Ideally, these would be standardized and consistent across the patients within a trial. Better yet, investiga-

### Practice and Dose Effects

A third issue that becomes apparent when examining the controlled trials of hypnotic analgesia for clinical pain concerns the marked variability in the amount of hypnotic treatment administered. Often, in the chronic pain studies for example, hypnotic treatment was provided in individual weekly sessions that lasted 45 min to 1.5 hr for 4 to 10 sessions over the course of 1 or 2 months. However, some patients received much less treatment at a time (e.g., 5–10 min of group hypnotic treatment at the end of a group therapy session; D. Spiegel & Bloom, 1983) or received treatment spread out over a longer period of time (e.g., sessions provided at intervals of 10–14 days; Anderson et al., 1975).

Only two studies with acute pain provided patients with audiotaped hypnosis instructions or suggestions to supplement those provided by the clinician, although both of these studies showed robust treatment effects (Harmon et al., 1990; Syrjala et al., 1992). However, many of the studies on chronic pain included audiotaped supplements and, although they all showed improvement over no treatment, effects were generally similar to those from autogenic or relaxation training studies (whose subjects also were often provided with audiotapes for practice; see Table 3). Unfortunately, none of the studies we reviewed included the presence or absence of an audiotape as an independent variable. Thus, at this time, we are not able to draw firm conclusions regarding the relative importance of home practice to treatment effects for either acute or chronic pain treatment.

Future research is needed to determine the extent to which there is a dose effect for hypnotic analgesia (e.g., by systematically varying the amount of hypnotic treatment received), as well as determine whether home practice improves the short- or long-term effects of hypnotic analgesia. At a minimum, controlled studies need to take these factors into account when designing experimental treatments and to ensure that they clearly indicate the number and length of hypnotic sessions administered, the extent to which subjects were required to practice outside of the sessions, and of great importance, whether the subjects complied with the practice recommendations.

### The Puzzle of Chronic Pain

This review indicates positive analgesic effects for the use of hypnosis with both chronic and acute pain. However, studies with acute pain often demonstrated that hypnosis is superior to other psychological interventions for pain; such has not been the case with chronic pain. In carefully scrutinizing the hypnotic suggestions given for chronic pain in the studies reviewed (see Table 4), we discovered that, as a whole, clinical studies performed with patients with chronic pain often appear to provide hypnotic suggestions that fail to appreciate the multifaceted and complex nature of pain. Our contention is that hypnosis is often applied to chronic pain in a simplistic manner, and that effect sizes and treatment duration could be enhanced if clinicians and researchers used this treatment with a more comprehensive understanding of this problem (or at least reported this if it was indeed their practice). The
following sections provide the rationale for this argument. In the remainder of this review we address some of the factors we believe may account for the inconsistent findings of hypnotic analgesia with chronic pain.

Pain Versus Suffering

A particularly vexing issue in applying hypnosis to chronic pain is that treatment must often address suffering rather than, or at least in addition to, pain (Fordyce, 1988) because chronic pain often persists in the absence of tissue damage (Loeser, 1982). There are at least five mechanisms that can result in suffering or pain behavior in the absence of nociception (tissue damage), and they are frequently present in patients with chronic pain. First, this group often has psychological disorders that, when treated, might alleviate the pain (Chibnall & Duckro, 1994; Geisser, Roth, Bachman, & Eckert, 1996; Romano & Turner, 1985). Second, patients with chronic pain often hold specific beliefs about their pain that are maladaptive, such as the beliefs that the source of their pain requires a biomedical solution, that pain is a signal of harm or physical damage, and that they are necessarily disabled by pain (M. P. Jensen, Turner, Romano, & Lawler, 1994); effective treatment involves modifying such thoughts (Turner & Romano, 2001). Third, somatization and somatosensory amplification are associated with chronic pain and a tendency to experience higher levels of pain (Barsky, Goodson, & Lane, 1988; Wilson et al., 1994). Fourth, operant or learning factors (social reinforcement in the form of unemployment compensation or attention from a solicitous spouse) often maintain pain behaviors in persons with chronic pain, well after a lesion is healed (Fordyce, 1976). Finally, chronic pain is thought to be maintained, at least in part, by deactivation, guarding and changes in body mechanics (Fordyce, 1976), and classic treatment involves systematic increases in strength and mobility, as well as multidisciplinary treatment with goals of returning patients to work, decreasing physician visits, lessening dependence on pain medication, and increasing functional activity (Turk & Okifuji, 1998).

Although appreciating such contributions to chronic pain may be apparent to theorists and practitioners in this area, studies on hypnotic analgesia of chronic pain problems make little or no mention of these factors. When chronic pain or suffering is primarily due to one or more of the factors discussed above, pain reduction may not be the primary goal of treatment. Pain treatment programs often have multiple indicators of treatment outcome, and pain reduction is often regarded to be less important than indicators of more functional activity (Turk & Okifuji, 1998). In fact, when hypnosis is used with some patients with chronic pain to reduce pain, the effect may be counterproductive. If a person with chronic pain is demonstrating illness conviction, he or she might regard hypnotic analgesia as a magical means to eliminate nociceptive input when the focus of treatment should be on any number of those factors discussed above. Yet, in almost every report or study discussed on the use of hypnosis with chronic pain, the primary role of hypnosis has been to decrease pain.

We believe that the impact of hypnosis on chronic pain might be strengthened if suggestions are geared toward reducing suffering or pain behaviors, or increasing activity and “well” behaviors, in addition to, or even in some cases rather than, suggestions for pain reduction. Chaves and Dworkin (1997) have pointed out that hypnotic analgesia has not been applied to chronic pain rehabilitation. In support of this conclusion is the fact that in all of the studies we reviewed there was no mention of providing suggestions for increasing activity for chronic pain or for fitting suggestions into the context of a larger treatment program (see Table 4). Rather, suggestions were almost exclusively geared toward relaxation, comfort, and analgesia. Hypnotic suggestions might be targeted toward increasing activity that is safely within the confines of the patient’s limitations. Because patients with chronic pain are often depressed and perhaps grieving loss of activity, relationships, or employment, suggestions can also be targeted toward improvement of affective state (Yapko, 1992). Another potentially useful application of hypnosis might be to help the patients alter their model of the etiology of pain. One of the biggest challenges in treating chronic pain is to motivate patients to engage in treatment, and one novel application would be to combine it with recent models for engaging patients in the treatment process (M. P. Jensen, 1996; Kerns & Rosenberg, 2000).

Increasing Treatment Effect

Montgomery et al. (2000) concluded from their meta-analysis of experimental and clinical studies that most people can benefit from hypnotic analgesia. Perhaps of equal importance with respect to chronic pain are findings from Kirsch, Montgomery and Sapirstein (1995), who performed a meta-analysis of 18 studies in which cognitive–behavioral therapy was compared with the same therapy supplemented by hypnosis. The results of their analysis indicated a substantial effect size with the addition of hypnosis; the authors estimated that more than 70% of the patients benefited from adding hypnotherapy to the treatment. We believe a neglected question is whether hypnosis can increase the treatment effects of multidisciplinary treatment programs. For example, Kirsch et al. reported that when hypnosis is added to an obesity program, weight loss is maintained over longer treatment periods. An effective practitioner working with patients with obesity certainly knows that treatment for this problem is multidimensional, involving increasing activity, stimulus control, and self-monitoring (Levitt, 1993; Wadden & Bell, 1990). An obesity specialist would also see the folly of using hypnosis as an isolated intervention for eliminating appetite. Isolated attempts to reduce pain levels in some patients with chronic pain via hypnosis is analogous to attempting to reduce appetite in patients with obesity. Hypnosis adds to the effects of a comprehensive program for weight loss, and it seems reasonable to hypothesize that it would do the same for chronic pain.

This notion was apparent as early as 1975, when Melzack and Perry (1975) demonstrated the efficacy of hypnosis with chronic pain in a controlled study (though admittedly not one including a placebo condition). To reiterate, the investigators found neither biofeedback nor hypnosis to be effective in themselves; however, the combination of treatments resulted in significantly enhanced clinical effects. More studies with chronic pain should investigate the use of hypnosis for chronic pain in concert with other approaches.

Specifying Suggestions

Studies with pain induced in the laboratory suggest that the nature of the hypnotic suggestion is an influential variable in
outcome. Perhaps the most salient example comes from the studies examining the impact of hypnotic analgesia on sensory versus affective pain. As discussed above, a number of researchers have speculated whether hypnotic analgesia has a greater effect on sensory versus affective components of pain (Price & Barber, 1987; Price et al., 1987), and Rainville et al.’s (1999) recent study indicated that the crucial variable was the nature of the hypnotic suggestion. Specifically, suggestions for sensory reductions of pain resulted in decreased activity in the somatosensory cortex, and suggestions for affective pain reduction led to decreased activity in the part of the brain that processes more emotional and suffering information. The one occasion where investigators in the Spinhoven laboratory (Zitman et al., 1992) found an advantage of hypnosis over autogenic training was when future oriented suggestions for pain control were made. Although yet to be tested in a controlled clinical trial, it follows that if a clinician desires that patients have pain control over the long term, then it is important to provide them with that suggestion specifically (J. Barber, 1998). Hypnotic suggestions for analgesia should also be targeted toward both sensory and affective dimensions of pain. Following the logic presented in the immediately preceding sections, if the goal of treatment is to increase activity, return to work or change an individual’s model of pain, then it makes sense to tailor at least some of the hypnotic suggestions accordingly.

**Analgesic Suggestions for Chronic Pain**

In spite of our recommendations for targeting hypnotic suggestions for multiple aspects of chronic pain treatment, we certainly acknowledge that in many cases suggestions for analgesia with such patients would be appropriate. Certainly pain that has ongoing noxious input (e.g., cancer, spinal cord injury, arthritis, diabetic neuropathy) and fewer of the nonnociceptive factors maintaining it may be more responsive to hypnotic analgesia. In his prolific writing on clinical applications of hypnosis, Erickson (1980; Erickson & Rossi, 1981; Erickson, Rossi, & Rossi, 1976) reported a number of anecdotally effective suggestions for chronic pain, including (a) those for the direct abolition of pain, (b) amnesia, (c) analgesia, (d) anesthesia, (e) posthypnotic relief, (f) time distortion, (g) reinterpretation of the experience, (h) dissociation, and (i) displacement. It is interesting, then, that Erickson noted that suggestions for the direct abolition of pain or complete anesthesia seldom showed lasting results (Erickson et al., 1976). He often recommended instead that the patient’s chronic pain be moved on a continuum to a less unpleasant level. As an example, Erickson (1980) suggested that a patient with a severe malignant pain would experience that sensation as an unpleasant itching mosquito bite.

Although not tested in any empirical studies, several writers have emphasized the need to provide suggestions for pain control to patients with chronic pain on several occasions over the course of time (J. Barber, 1996; Crasilneck, 1995). We earlier described J. Holroyd’s (1996) point that hypnosis can be repeatedly practiced even by those low in suggestibility much like a form of meditation (see also Alden & Heap, 1998), and Barabasz’s (1982; Barabasz & Barabasz, 1989) findings that both hypnotizability and pain tolerance can be increased with restricted environmental stimulation. Along the same lines, the prevailing clinical wisdom is that most patients receiving hypnosis for chronic pain should be taught self-hypnotic skills that generalize beyond the treatment setting. Few, if any, writers have suggested that chronic pain can be modified through a single session, and most of the studies we reviewed with this clinical problem used audiotapes to supplement clinical work. The fact that clinicians who are successful with chronic pain usually provide treatment over multiple sessions introduces the confounds inherent in psychotherapy. We simply cannot determine whether reported reductions in pain result from hypnotic suggestions, some artifacts of the therapeutic relationship, or (perhaps more likely) some combination of these factors. This is an area that is certainly in need of further exploration.

Another question that requires investigation concerns the relative efficacy of hypnotic analgesia for different types of pain problems. For example, it is reasonable to hypothesize that suffering that is maintained by social–financial disincentives may be less likely to respond to suggestions for analgesia. However, there are multiple forms of chronic pain, many of which are known to show varying responses to therapeutic modalities. The aforementioned headache studies suggest, for example, that headache pain responds equally well to hypnosis and autogenic training, but this seems to be the only definitive line of research for a specific pain etiology. Researchers need to determine the types of pain most responsive to hypnotic interventions (e.g., musculoskeletal, neuropathic, malignant or other causes of pain). Clinicians likely have their opinions concerning which types of pain they can treat effectively with hypnosis, but at this point, such conjectures remain as hypotheses to be tested.

Even if the goal of treatment is to increase physical activity, suggestions for pain relief might be of value. A patient who is skeptical about psychological treatment might be given suggestions for pain relief, with the hope that this would not only produce a short-term (and perhaps long-term) reduction in suffering and pain intensity but also increase rapport with the clinician and investment in treatment. This might pave the way for the often more difficult task of changing patients’ beliefs about pain etiology and engaging them in the challenging exercises and lifestyle changes that are an integral component of many successful chronic pain treatments.

**Summary and Conclusions**

Pain is a health care issue that results in significant suffering and financial cost. The time has arrived to determine whether there is enough scientific evidence to justify the use of hypnosis as a viable treatment for pain. For the most part, the focus of most laboratory-based studies has been on examining the effects of hypnosis on perceived pain intensity. The results of these studies demonstrate consistent effects of hypnosis on pain reduction, and have contributed to the theoretical understanding of hypnotic analgesia. More recently, a number of neurophysiological studies have taken these findings to a new level of sophistication.

In this article we sought to provide a comprehensive review of the controlled trials of hypnosis for clinical pain. The findings from acute pain studies demonstrate consistent clinical effects with hypnotic analgesia that are superior to attention or standard care control conditions, and often superior to other viable pain treatments. Although earlier reviews did not provide support for the efficacy of hypnosis for chronic pain, these reviews were based on very few controlled clinical trials. In the past 2 decades, a greater
number of controlled trials of hypnosis for chronic pain have been published. The findings from these studies show that hypnotic analgesia is consistently superior to no treatment but equivalent to relaxation and autogenic training for chronic pain conditions.

A number of important methodological issues surfaced in this review, the primary ones being the importance of measuring hypnotic suggestibility, controlling for nonspecific effects, and considering dose effects. Our findings suggest that acute and chronic pain represent disparate clinical issues for hypnotic analgesia; the treatment of chronic pain involves multidimensional assessment and treatment, and the clinician or hypnotist treating such problems should have an appreciation of the complexity of this problem. Although controlled clinical studies on hypnotic analgesia have substantial room for improvement, at this point the available evidence indicates that hypnosis is a viable intervention for both acute and chronic pain conditions.

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Rapid Induction Analgesia: A Clinical Report

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This is a report of clinical dental experience using a newly developed, hypnotic pain control procedure. Characteristics of the procedure are outlined, an explanation for its success is suggested, and the broader implications of this success are discussed. The unusually high incidence of clinical analgesia rapidly obtained with this procedure leads the author to question the meaning and relevance of the concept of “hypnotic susceptibility” for the practical clinical application of hypnosis.

Hypnosis has been demonstrated to be a powerful analgesic sometimes clinically useful as an alternative to chemical analgesics (Hilgard & Hilgard, 1975). The primary advantage of using hypnosis rather than introducing a chemical analgesic into the body is that any chemical entails potential risk. Further, local anesthetics ordinarily leave the patient with annoying numbness. In hypnosis there are no demonstrable physiological risks, and no side effects such as numbness occur. However, hypnosis is not the analgesic of choice and is not used routinely as an analgesic. The primary reason for this is that hypnosis has been found to be ineffective as an analgesic in most people. It has been consistently found that only highly susceptible individuals have probable benefit from hypnotic analgesia, and that not all highly susceptible individuals will be affected (Hilgard & Hilgard, 1975). Gottfredson, for instance, found that 75% of highly susceptible individuals were able to comfortably complete their dental treatment using hypnosis, and only 38% of low susceptibles were. Hilgard and

Hilgard (1975) present a clear case for the consistent positive correlation between high susceptibility and successful hypnotic analgesia. It is widely concluded that only a small percentage of individuals is able to successfully develop hypnotic analgesia. Hypnotic analgesia, then, has not been found to be of general practical clinical use. New evidence, however, suggests a different conclusion.

A recent experiment involved the development of a hypnotic analgesia procedure, Rapid Induction Analgesia (RIA), which was effective in controlling experimental dental pain in 27 out of 27 volunteer subjects (Mayer, Price, Barber, & Rafii, 1976). This unexpected rate of success created interest in evaluating the clinical effectiveness of the procedure. This paper describes the author’s recent clinical experience with RIA as the sole analgesic tool in dental treatment.

The author’s purpose was to evaluate the efficacy of RIA in a clinical context. One hundred patients were seen by the author in 10 dental offices over a period of three months. They were regularly scheduled patients, appointed for a normal variety of procedures (including fillings, root canal treatments, crown preparations, and extrac-
tions). Patients ranged in age from four to 67 years. Each patient denied prior experience with hypnosis (except two patients, who reported previous failure to develop hypnosis). In some offices the patients were asked if they would like to try a new technique involving hypnosis; in most offices, the author was simply introduced as the dentist's associate, whereupon the author began the procedure. (This introduction was not systematically varied, but was totally left to each dentist's preference.)

While the introduction to the patient was taking place, suggestions for relaxation were interspersed in normal conversation and the induction was immediately begun. Suggestions for deep relaxation, for comfort, for the reinterpretation of events, and for amnesia were given. A posthypnotic suggestion was given to elicit analgesia during dental treatment. The patient was then aroused fully. Only after the patient appeared to be fully alert did the dentist begin the dental treatment. The time lapse between the author's introduction to the patient and the initiation of dental treatment never exceeded 20 minutes and nearly always was less than 11 minutes. See the Appendix for a complete transcript of an induction of one dental patient.

The following are three typical examples of the 100, taken from my casebook:

Female, 19 years old. Rampant dental decay. Initially cooperative, amused, responds verbally at every opportunity. Duration of RIA: 10 minutes. Dental procedure: four fillings, upper and lower right quadrants. Patient's remark at the end of appointment: "My tooth felt numb, like with novacaine. . . . You relaxed me and the doctor filled my teeth and I didn't feel anything."

The patient was subsequently treated by the dentist on five different occasions over a period of six weeks following this initial visit. At each appointment, work was begun by employment of a posthypnotic cue which had been left with the patient. Dental work always was begun within one minute, with never any indication that the patient experienced anything but pleasantness.


Because the patient was quite cooperative and because there was no numbness associated with this phenomenon (since analgesia, not anesthesia, is suggested), more dental work was done at that appointment than had been planned. Subsequent visits were begun by initiation of the posthypnotic cue and the dental procedure then commenced.

Male, 30 years old. Describes self (confirmed by dentist) as having "a very low pain threshold." Was in previous day with emergency. Much experience of dental discomfort. Not at all cooperative; enormously skeptical. ("I can't be hypnotized; a stage hypnotist tried once, and I can't be. You can do what you like; it's your time you're wasting.") Duration of RIA: 10 minutes. Dental procedure: root canal treatment.

Following completion of the dental treatment, the patient was asked if this appointment could be characterized as any more or less pleasant than previous ones. His reply was, "Well, this appointment wasn't unpleasant, but then there wasn't any reason for it to be. I still wasn't hypnotized. I know I wasn't. I'd have felt pain if you'd done anything to hurt me." No further dental treatment was required and this patient was not seen further.

Of the 100 patients, 99 completed their dental treatment comfortably with no chemical anesthetic. Only one patient required an anesthetic injection in order to be comfortable. This patient was a 45-year-old woman who was to have root canal treat-
ment done on three teeth. She was quite apprehensive and expressed hope that her experience could be painless. RIA lasted 15 minutes. The patient remained comfortable through half the treatment, then began wincing. An injection was given and the remainder of the work was accomplished, though the patient reported continued mild discomfort.\(^3\)

The rapid achievement of effective clinical analgesia in 99 out of 100 cases brings into question the widely accepted notion that hypnosis is not a reliable or otherwise practical analgesic tool. In experimental and clinical contexts, RIA has been effective, reliable, and practical.

It might be suggested that this effectiveness was due to a fortunate sample of subjects (i.e., they were all highly susceptible). Since hypnotic susceptibility was not measured in the work of Mayer et al. (1976) nor in these clinical dental patients, this possibility was not evaluated. A recent investigation by Barber (1976) did, however, evaluate this issue. No correlation was found between susceptibility and RIA-induced analgesia to experimental dental pain in 17 university students. Perhaps, then, this experimental and clinical success is not due to qualities of the subjects, but, rather, is due to characteristics of the procedure itself. A description of some of these characteristics may be helpful in evaluating this possibility.

The crux of this procedure, like any other, involves the clear, if implicative, communication of certain ideas. The particular choice of words used was dependent upon service of this goal. The first idea communicated was: nothing is going to be done to you. You are, and will be, free to listen or not, to respond or not. You have a natural ability to relax and you may enjoy using that ability now. Whatever you do, whatever you experience, is perfectly acceptable, perfectly normal, perfectly adequate to this situation.

The second idea: you have the ability to notice things, both inside your body and around you. You can notice things now, you can continue to notice things, and you can be ready to begin noticing more and more things.

The third idea: the meaning of what we notice is changeable; reinterpretation of events can and does take place. Sounds, for instance, which were once distracting can be noticed to be less and less distracting. Any part of your experience can be made a part of your experience of comfort and relaxation.

The fourth idea: memory, by nature, is alterable. It is good and natural that we can let impressions be forgotten, if temporarily. Every moment of every day you choose to forget some things in order to be able to remember others. It doesn’t matter when you choose to remember, nor does it matter how.

The fifth idea: the comfortable feelings you are now experiencing can be experienced again, any time, easily and quickly.

The way that these ideas were incorporated into the rapid induction analgesia procedure depended, of course, on the needs of the particular situation. Each idea was always communicated, however. Clearly, these ideas were common to many hypnotic analgesia procedures. There are two characteristics of this communication, however, which do seem unusual. First, the analgesic suggestions are always framed in a posthypnotic context. This is to provide that a subsequent hypnotic state will be readily developed (Erickson & Erickson, 1941) and that the subject will also be alert and

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\(^2\) This case is of interest because it represents a failure, the cause of which remains as yet unexplained, though several possibilities present themselves, including an evident dislike between dentist and patient (who were relatives), and the fact of a sudden interruption during the dental treatment by an aide who rushed in and (mistakenly) reported that "The president's been shot!"
able to take an active part in the proceedings rather than exhibit lethargy characteristic of a "deep" hypnotic state.

This characteristic may account, in part, for the rapidity of successful induction of analgesia in so many cases. Commonly, other hypnotic procedures involve efforts toward "deepening" the subject's hypnotic state. Such a process often takes a minimum of 45 minutes, frequently much longer, and often is not successful (Scott, 1974; Hilgard & Hilgard, 1975). When sufficient "depth" is achieved, throughout the normally painful experience, experimental or clinical, the subject remains in this "deep" state, characterized by relaxed, lethargic unresponsiveness to external events.

The situation created by RIA is quite different. The subject is aroused from the initial hypnotic state before any analgesic testing is made. The dental treatment takes place only after this arousal. At the framing of the situation as involving the posthypnotic cue, however, the patient becomes clearly analgesic to painful stimuli. The posthypnotic cue used in RIA, for instance, lifting the patient's wrist, may cause the patient to "automatically" develop the hypnotic state (to become somnambulistic) and thereby analgesic. The "spontaneous" development of the hypnotic state in order to carry out the posthypnotic behavior (the development of analgesia) may account for the "rapid induction" characteristic of RIA.

This may also account for the unusually successful results in developing analgesia. It is characteristic of a patient hypnotized for the first time to expect that distractions can disrupt the relaxing experience. This is particularly so when some anxiety exists about the dental experience. When in the somnambulistic state, however, the patient does not experience such apprehension about distraction (partly, perhaps, because of the lack of awareness that there is any state to be disrupted). Since relaxation is often associated with the hypnotic state, this absence of tension may contribute to the ability to develop analgesia.

A second characteristic of RIA which may be relevant to explaining its success is the language it employs. Suggestions are consistently permissive, so that resistance is not potentiated. Direct suggestions for analgesia are always avoided. Analgesia suggestions are indirect and gradual and follow the theme that "... there is nothing to bother you, and nothing to disturb you..." Great care is taken to make clear that the patient is always in control, that the hypnotist is merely suggesting certain experiences which the patient may or may not choose to create. This point is made carefully with both analgesia and amnesia suggestions so that the patient's need to remain independent is not threatened. It may be, then, that individuals who feel threatened by standard induction procedures and who do not respond well to them (and who are then defined as "non-susceptible"), are not threatened by the permissive communication of RIA and are willing to involve themselves in the procedure. Since there is evidence to believe that susceptibility to hypnosis is not related to the success of RIA, this may be a useful explanation.

Whatever the explanation for the unusual success of RIA, these findings should lead to a reexamination of the practicality of clinical dental hypnosis. RIA is a simple procedure, requires no previous training of patients, requires no overt response from the patient, takes relatively little time to achieve, and is effective in virtually every instance. In addition to the author's personal clinical experience, subsequent successful experience of clinicians who have been trained in the use of RIA also leads to the conclusion that RIA is practically useful for a variety of dental procedures.

If one assumes that successful analgesia
is not susceptibility-dependent, perhaps even more practical hypnotic procedures will be developed. While the clinical discussion in this paper has described practical analgesia in the dental office, perhaps increased use of RIA will provide information on the wider applicability in a variety of clinical contexts. It may be that this procedure will prove to be of practical value in a wide range of medical situations. Although no current explanation satisfactorily accounts for the effectiveness of RIA, its successful use suggests that hypnosis can be used as a convenient, rapid, and effective analgesic alternative to chemical analgesia or anesthesia. Further research is necessary to determine the limitations and optimal application of this procedure.

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REFERENCES


APPENDIX

RAPID INDUCTION ANALGESIA PROCEDURE

The purpose of the following procedure is to develop complete analgesia and muscular relaxation in as short a time as possible (approximately 10 minutes).

Elicitation of cooperation

I'd like to talk with you for a moment to see if you’d like to feel more comfortable and relaxed than you might expect. Would you like to feel more comfortable than you do right now?

I'm quite sure that it will seem to you that I have really done nothing, that nothing has happened at all. You may feel a bit more relaxed, in a moment, but I doubt that you'll notice any other changes. I'd like you to notice, though, if you're surprised by anything else you might notice. OK, then . . . the really best way to begin feeling more comfortable is to just begin by sitting as comfortably as you can right now . . . go ahead and adjust yourself to the most comfortable position you like . . . that's fine. Now, I'd like you to notice how much more comfortable you can feel by just taking one very big, satisfying deep breath. Go ahead . . . big, deep, satisfying breath . . . That's fine. You may already notice how good that feels . . . how warm your neck and shoulders can
feel . . . Now, then . . . I’d like you to take four more very deep, very comfortable breaths . . . and, as you exhale, notice . . . just notice how comfortable your shoulders can become . . . and notice how comfortable your eyes can feel when they close . . . and when they close, just let them stay closed . . . that’s right, just notice that . . . and notice, too, how, when you exhale, you can just feel that relaxation beginning to sink in . . . Good, that’s fine . . . now, as you continue breathing, comfortably and deeply and rhythmically, all I’d like you to do is to picture in your mind . . . just imagine a staircase, any kind you like . . . with 20 steps, and you at the top . . . Now, you don’t need to see all 20 steps at once, you can see any or all of the staircase, any way you like . . . that’s fine . . . Just notice yourself, at the top of the staircase, and the step you’re on, and any others you like . . . however you see it is fine . . . Now, in a moment, but not yet, I’m going to begin to count, out loud, from one to 20, and . . . as you may already have guessed . . . as I count each number I’d like you to take a step down that staircase . . . see yourself stepping down, feel yourself stepping down, one step for each number I count . . . and all you need to do is notice, just notice, how much more comfortable and relaxed you can feel at each step, as you go down the staircase . . . one step for each number that I count . . . the larger the number, the farther down the staircase . . . the farther down the staircase, the more comfortable you can feel . . . one step for each number . . . all right, you can begin to get ready . . . now, I’m going to begin . . . one . . . one step down the staircase . . . two . . . two steps down the staircase . . . that’s fine . . . THREE . . . three steps down the staircase . . . and maybe you already notice how much more relaxed you can feel . . . I wonder if there are places in your body that feel more relaxed than others . . . perhaps your shoulders feel more relaxed than your neck . . . perhaps your legs feel more relaxed than your arms . . . I don’t know, and it really doesn’t matter . . . all that matters is that you feel comfortable . . . that’s all . . . FOUR . . . four steps down the staircase, perhaps feeling already places in your body beginning to relax . . . I wonder if the deep relaxing, restful heaviness in your forehead is already beginning to spread and flow . . . down, across your eyes, down across your face, into your mouth and jaw . . . down through your neck, deep, restful, heavy . . . FIVE . . . five steps down the staircase . . . a quarter of the way down, and already beginning, perhaps, to really, really enjoy your relaxation and comfort . . . SIX . . . six steps down the staircase . . . perhaps beginning to notice that the sounds which were distracting become less so . . . that all the sounds you can hear become a part of your experience of comfort and relaxation . . . anything you can notice.
Confusingly, permissively eliciting arm heaviness becomes a part of your experience of comfort and relaxation... SEVEN... seven steps down the staircase... that's fine... perhaps noticing the heavy, restful, comfortably relaxing feeling spreading down into your shoulders, into your arms... I wonder if you notice one arm feeling heavier than the other... perhaps your left arm feels a bit heavier than your right... perhaps your right arm feels heavier than your left... I don't know, perhaps they both feel equally, comfortably heavy... It really doesn't matter... just letting yourself become more and more aware of that comfortable heaviness... or is it a feeling of lightness?... I really don't know, and it really doesn't matter... EIGHT... eight steps down the staircase... perhaps noticing that, even as you relax, your heart seems to beat much faster and harder than you might expect, perhaps noticing the tingling in your fingers... perhaps wondering about the fluttering of your heavy eyelids... NINE... nine steps down the staircase, breathing comfortably, slowly, and deeply... restful, noticing that heaviness really beginning to sink in, as you continue to notice the pleasant, restful, comfortable relaxation just spread through your body... TEN... ten steps down the staircase... halfway to the bottom of the staircase, wondering perhaps what might be happening, perhaps wondering if anything at all is happening... and yet, knowing that it really doesn’t matter, feeling so pleasantly restful, just continuing to notice the growing, spreading, comfortable relaxation... ELEVEN... eleven steps down the staircase... noticing maybe that as you feel increasingly heavy, more and more comfortable, there’s nothing to bother you, nothing to disturb you, as you become deeper and deeper relaxed... TWELVE... twelve steps down the staircase... I wonder if you notice how easily you can hear the sound of my voice... how easily you can understand the words I say... with nothing to bother, nothing to disturb... THIRTEEN... thirteen steps down the staircase, feeling more and more the real enjoyment of this relaxation and comfort... FOURTEEN... fourteen steps down the staircase... noticing perhaps the sinking, restful pleasantness as your body seems to just sink down, deeper and deeper into the chair, with nothing to bother, nothing to disturb... as though the chair holds you, comfortably and warmly... FIFTEEN... fifteen steps down the staircase... three-quarters of the way down the staircase... deeper and deeper relaxed, absolutely nothing at all to do... but just enjoy yourself... SIXTEEN... sixteen steps down the staircase... wondering perhaps what to experience at the bottom of the staircase... and yet knowing how much more ready you already feel to become deeper and deeper relaxed... more and more comfortable, with nothing to bother, nothing to disturb... SEVENTEEN... seventeen steps down...
the staircase . . . closer and closer to the bottom, perhaps feeling your heart beating harder and harder, perhaps feeling the heaviness in your arms and legs become even more clearly comfortable . . . knowing that nothing really matters except your enjoyment of your experience of comfortable relaxation, with nothing to bother, nothing to disturb . . . EIGHTEEN . . . eighteen steps down the staircase . . . almost to the bottom, with nothing to bother, nothing to disturb, as you continue to go deeper and deeper relaxed . . . heavy . . . comfortable . . . restful . . . relaxed . . . nothing really to do, no one to please, no one to satisfy . . . just to notice how very comfortable and heavy you can feel, and continue to feel as you continue to breathe, slowly and comfortably . . . restfully . . . NINETEEN . . . nineteen steps down the staircase . . . almost to the bottom of the staircase . . . nothing to bother, nothing to disturb you as you continue to feel more and more comfortable, more and more relaxed, more and more rested . . . more and more comfortable . . . just noticing . . . and now . . . TWENTY . . . bottom of the staircase . . . deeply, deeply relaxed . . . deeper with every breath you take . . . as I talk to you for a moment about something you already know a lot about . . . remembering and forgetting . . . you know a lot about it, because we all do a lot of it . . . every moment, of every day you remember . . . and then you forget, so you can remember something else . . . you can't remember everything, all at once, so you let some memories move quietly back in your mind . . . I wonder, for instance, if you remember what you had for lunch yesterday . . . I would guess that, with not too much effort, you can remember what you had for lunch yesterday . . . and yet . . . I wonder if you remember what you had for lunch a month ago today . . . I would guess the effort is really too great to dig up that memory, though of course it is there . . . somewhere, deep in the back of your mind . . . no need to remember, so you don't . . . and I wonder if you'll be pleased to notice that the things we talk about today, with your eyes closed, are things which you'll remember tomorrow, or the next day . . . or next week . . . I wonder if you'll decide to let the memory of these things rest quietly in the back of your mind . . . or if you'll remember gradually, a bit at a time . . . or perhaps all at once, to be again resting in the back of your mind . . . perhaps you'll be surprised to notice that the reception room is the place for memory to surface . . . perhaps not . . . perhaps you'll notice that it is more comfortable to remember on another day altogether . . . it really doesn't matter. . . . doesn't matter at all. . . . whatever you do, however you choose to remember . . . is just fine . . . absolutely natural . . . doesn't matter at all . . . whether you remember tomorrow or the next day, whether you remember all at once, or gradual-
Analgesia suggestions

Every sensation creates the analgesic experience (nothing detracts from it)

Direct posthypnotic suggestion for analgesia

Posthypnotic suggestion for a variety of behaviors, but with purpose of developing a trance... and with implication for analgesia

ly... completely or only partially... whether you let the memory rest quietly and comfortably in the back of your mind... really doesn’t matter at all... and, too, I wonder if you’ll notice that you’ll feel surprised that your visit here today is so much more pleasant and comfortable than you might have expected... I wonder if you’ll notice that surprise... that there are no other feelings... perhaps you’ll feel curious about that surprise... surprise, curiosity... I wonder if you’ll be pleased to notice that today... and any day... whenever you feel your head resting back against the headrest... when you feel your head resting back like this... you’ll feel reminded of how very comfortable you are feeling right now... even more comfortable than you feel even now... comfortable, relaxed... nothing to bother, nothing to disturb... I wonder if you’ll be reminded of this comfort, too, and relaxation, by just noticing the brightness of the light up above... perhaps this comfort and relaxation will come flooding back, quickly and automatically, whenever you find yourself beginning to sit down in the dental chair... I don’t know exactly how it will seem... I only know, as perhaps you also know... that your experience will seem surprisingly more pleasant, surprisingly more comfortable, surprisingly more restful than you might expect... with nothing to bother, nothing to disturb... whatever you are able to notice... everything can be a part of your experience of comfortlessness, restfulness and restfulness and relaxation... everything you notice can be a part of being absolutely comfortable... and I want to remind you that whenever [doctor’s name] touches your right shoulder, like this... whenever it is appropriate, and only when it is appropriate... whenever [doctor’s name] touches your right shoulder, like this... or whenever I touch your right shoulder, like this... you’ll experience a feeling... a feeling of being ready to do something... whenever I touch your right shoulder, like this... or whenever [doctor’s name] touches your right shoulder, like this... you’ll experience a feeling... a feeling of being ready to do something... perhaps a feeling of being ready to close your eyes... perhaps a feeling of being ready to be even more comfortable... perhaps ready to know even more clearly that there’s nothing to bother, nothing to disturb... perhaps ready to become heavy and tired... I don’t know... but whenever I touch your right shoulder, like this... you’ll experience a feeling... a feeling of being ready to do something... it really doesn’t matter... perhaps just a feeling of being ready to be even more surprised... it doesn’t really matter... nothing really matters but your experience of comfort and relaxation... absolutely deep comfort and relaxation... with nothing to bother and nothing to disturb... that’s fine... and now, as you continue to
RAPID ANALGESIA

Preparation for end to this comfortable experience

Suggestion for arousal

Numbers on inhalation . . . lilting, arousing intonations . . . more quickly at first . . . watch for responsiveness.

If no apparent arousal, slow down, inject more suggestion for arousal.

After 5, increasingly slowly . . . repeat suggestions for arousal and positive experience

Since the subject has been given posthypnotic suggestions as part of the initial hypnotic experience, it is now possible to elicit an even more satisfactory hypnotic state (including development of analgesia) by utilizing one or more of the posthypnotic cues suggested. Whenever in the future cues are properly given, the subject rapidly and automatically develops a satisfactory hypnotic state and is adequately analgesic for clinical procedures.
The Neurophysiology of Pain Perception and Hypnotic Analgesia: Implications for Clinical Practice

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Abstract
Although there remains much to be learned, a great deal is now known about the neurophysiological processes involved in the experience of pain. Research confirms that there is no single focal "center" in the brain responsible for the experience of pain. Rather, pain is the end product of a number of integrated networks that involve activity at multiple cortical and subcortical sites. Our current knowledge about the neurophysiological mechanisms of pain has important implications for understanding the mechanisms underlying the effects of hypnotic analgesia treatments, as well as for improving clinical practice. This article is written for the clinician who uses hypnotic interventions for pain management. It begins with an overview of what is known about the neurophysiological basis of pain and hypnotic analgesia, and then discusses how clinicians can use this knowledge for (1) organizing the types of suggestions that can be used when providing hypnotic treatment, and (2) maximizing the efficacy of hypnotic interventions in clients presenting with pain problems.

Keywords: Hypnotic analgesia, pain, hypnosis, neurophysiology.

A preponderance of evidence indicates that hypnotic analgesia can significantly and substantially reduce pain associated with both acute and chronic pain conditions (Jensen & Patterson, 2006; Montgomery, DuHamel & Redd, 2000; Patterson & Jensen, 2003). However, clinicians who use hypnotic interventions to treat individuals with pain use a large variety of hypnotic approaches and suggestions, varying from quite focused suggestions for reducing or blocking the experience of pain sensations (e.g., Crasilneck, 1979) to more general and diffuse suggestions to have experiences inconsistent with pain and suffering, such as the vivid reliving of pleasurable autobiographical experiences (Faymonville, M. E., et al., 2000). Often clinicians report that with any one patient they provide just one or two of the many
possible suggestions that might be effective for pain management (Evans, 1989; Gainer, 1992; James, Large, & Beale, 1989), although it is not always clear why the particular suggestions used were chosen over others. There is also a tendency for clinicians to focus on suggestions that target the sensory components of pain, as opposed to using or including suggestions that address pain’s emotional, motivational, cognitive, and behavioral components (Crasilneck, 1995; Evans, 1989; Gainer, 1992; Jack, 1999; Lu, Lu, & Kleinman, 2001; Simon & Lewis, 2000; Williamson, 2004; see Abrahamsen, Baad-Hansen, & Svensson, in press, and Sachs, Feuerstein, & Vitale, 1977, for descriptions of more comprehensive hypnotic analgesia treatment approaches).

During the past decade, there has been an explosion of knowledge about the neurophysiological basis of pain and hypnotic analgesia. This knowledge has important implications for understanding how hypnosis might be most effectively applied to clinical pain problems. The purpose of this review article is to provide a brief overview of the current state of the science knowledge concerning the neurophysiological basis of pain and hypnotic pain management, and to then discuss the implications for this knowledge for organizing and expanding the types of hypnotic suggestions that might be considered when providing hypnotic interventions for pain management.

**Mechanisms Involved in Pain Perception and Regulation**

In the 1600s, the French philosopher René Descartes argued that pain was a simple reflexive response to physical damage. In his model, information about physical damage detected by sensors in the skin is transmitted directly through a single channel to a “pain center” in the brain. Descartes viewed the brain as a passive recipient of sensory information; “real” pain was thought to be entirely or at least mostly, related to the amount of physical damage that existed outside of the nervous system in the peripheral tissue. Descartes’s model of pain (called the “specificity theory”) remained the generally accepted view of scientists and health care providers for the next 300 years.

Beginning, perhaps with the publication of the gate control theory of pain in 1965 (Melzack & Wall, 1965), but particularly during the past decade, pain researchers have shifted at least some of their attention away from the periphery and have focused more on activity in the spinal cord and the brain. As a result, we now know that the brain is not merely a passive recipient of the nociceptive information it receives. Rather, the spinal cord and brain actively process and modulate that information in multiple areas. There is no “pain center” in the brain. Instead, multiple integrated pain networks work together to contribute to the global experience of pain.

Although it can be argued that the brain is the final common pathway to the experience of pain (“no brain — no pain”), the neurophysiological processes that underlie the experience of pain have peripherally (outside of the spinal cord; for example, in the limbs), spinal, and supraspinal (above the spinal cord; that is, in the brain stem and brain) nervous system components. This section provides a brief overview of the primary neurophysiological structures and mechanisms involved in pain perception. However, it should be kept in mind that what follows is a very general overview; the reader interested in greater detail should read several of the many excellent reviews and texts on this topic that were used as primary sources for the material presented in this section (Apkarian, Bushnell, Treede, Zubieta, 2005; Byers & Bonica, 2001; Craig, 2003; DeLeo, 2006; Rainville, 2002; Terman & Bonica, 2001).

**Peripheral Mechanisms**

All bodily tissues are innervated by receptors that respond to physical injury. These receptor are classified as a function of the type of nerve fibers they connect to. The nerve fibers that transmit most of the information about physical damage are the thin (thin because they do not have a myel sheath covering them, which also makes them transmit information more slowly) C fibers and thick (myelinated, therefore faster) A-delta fibers. A third type of fiber, A-beta, that normally carry information related to touch, can also transmit information that contributes to the experience of pain (see Figure 1...
Figure 1: The primary nervous system structures involved in the processing and experience of pain.
The stimulation or damage that excites these receptors, and the information about this stimulation transmitted along the C, A-delta, and A-beta fibers, is not pain. Pain does not occur until structures in the brain become activated and involved. Rather, the information from nerve receptors that communicate physical damage or the potential for physical damage is called nociception (from the Latin, nocere, which means harm or injury); the receptors that trigger this information are called nociceptors. Nociceptors can be more or less sensitized, and therefore respond differently at different times to the same amount of stimulation or damage. The mechanical and chemical changes that sensitize or inhibit nociceptors are exceedingly complex, and can change as a function of many factors.

Spinal Mechanisms

The fibers that communicate nociceptive information from the periphery to the central nervous system, including C, A-delta, and A-beta fibers, enter the spine at the dorsal horn (see Figure 1). Here, they terminate and then synapse with the dendrites and neurons of the spinothalamic tract (STT). The STT is the most important (but not only) pathway for the transmission of nociception to the brain. The relative responsivity of STT cells is influenced by activity coming down to the dorsal horn from supraspinal sites. Some of the first clear evidence for descending inhibition came from research demonstrating that electrical stimulation of the periaqueductal gray (PAG) area in the midbrain resulted in significant analgesia at different sites in the body. Moreover, the PAG itself receives significant input from various sites in the brain, including the insula, the anterior cingulate cortex, and the sensory cortex; all areas known to be involved in the processing of pain (see next section).

Supraspinal (Above the Spine) Mechanisms

Although the discussion so far has focused on peripheral and spinal mechanisms of nociception, it is important to keep in mind that the activation of these mechanisms is neither necessary nor sufficient to produce the perception of pain. Pain is perceived when complex integrated cortical (supraspinal) systems are engaged with or without the presence of nociception; and pain can be relieved when these same systems are disengaged or interrupted.

A number of supraspinal sites have been shown to be involved in the perception of pain, but the most consistent areas that have been identified across different imaging studies are the thalamus, the primary and secondary somatosensory cortex (S1 and S2), the anterior cingulate cortex, the insula, and the prefrontal cortex (see Figure 1; see also Apkarian, Bushnell, Treede, & Zubieta, 2005). These brain areas and structures work closely together and with other CNS structures in an integrated fashion to produce the experience we label as pain.

Thalamus

The thalamus is located just above the brain stem. It can be considered the primary relay center for transmitting sensory information from the periphery and spinal cord to various sites in the cortex. The STT neurons that originate in the dorsal horns of the spinal cord terminate in a number of different areas of the thalamus, each of which then projects further to various cortical structures. Neurons from one of these areas project to the primary sensory cortex (S1), the posterior parietal cortex, and the secondary sensory cortex (S2). Neurons from other areas project, separately, to (1) the insula, (2) the anterior cingulate cortex, and (3) the prefrontal cortex. Yet another area in the thalamus where STT cells terminate projects diffusely to a number of sites of the brain other than the cerebral cortex. Electrical stimulation of these nuclei has clear (indirect) cortical effects, primarily producing a general activation. In short, cells in the thalamus that receive nociception information via the STT project directly too many different areas in the cortex.
Somatosensory cortex

The somatosensory cortex is divided into primary (S1) and secondary (S2) areas. S1 cortex lies in strip on the surface of the brain just behind the motor cortex, and the neurons in the S1 cortex are organized in such a way that each area of the body represented in distinct and well-defined loci within the S1. The S2 cortex lies at the base of the S1 cortex in the parietal lobe. The number of S2 neurons that respond to noxious stimulation via the thalamus appears to be relatively small. Nevertheless, S2 neurons (along with neurons in the insula) are among the first in the cortex to receive nociceptive input (Apkarian, Bushnell, Treede, & Zubieta, 2005). It is thought that S1 and S2 cortex both encode spatial information about nociception (that is, they help to tell us where on the body damage has or might have occurred), and that the S2 cortex, perhaps more than S1, is involved in encoding the severity and quality of the stimulus/nociception (Chudler & Bonica, 2001; May, 2007; Miltner & Weiss, 1998).

Anterior cingulate cortex

The anterior cingulate cortex (ACC) lies in the front part of the cingulate cortex, which itself lies just above the corpus colossum in the fissure of cortical tissue that separates the brain’s two hemispheres. The ACC is one of the structures of the limbic system, and is related to a large number of processes and activities. Evidence supports the conclusion that pain-related activity in the ACC is related to the affective/emotional component of pain (Apkarian, Bushnell, Treede, & Zubieta, 2005). Findings also suggest that pain-related ACC activity subserves the motivational-motor aspects of pain (i.e., getting ready to do something about the pain), including the facilitation of cognitive, behavioral and emotional coping efforts (Rainville, 2002; Craig, 2003).

Insula

Although the insula is part of the neocortex (the surface of the brain), it lies deeply inside a fold (the Sylvian fissure) of the brain, near the sensory cortex. Like the ACC, the insula is a component of the limbic system. Craig (in press) has argued that the insula is primarily the sensory component of the limbic system, and is responsible for encoding a person’s sense of his or her physical condition across a number of domains as they relate to motivation (the extent to which we “feel” thirsty, hungry, pain, or itch, versus feel satisfied and physically content). When discrepancies exist between (1) what the brain is hardwired to know the body needs for survival (oxygen, food, physical integrity) and (2) what the brain perceives (a lack of oxygen, low blood sugar, pain), alarm bells ring; and the insula may be largely responsible for determining when (and how loud) those bells should ring.

Prefrontal cortex

The prefrontal cortex lies on the front of the frontal lobes (see Figure 1). This area of the brain is generally thought to be involved in the planning of complex cognitive responses and in moderating social behavior, among other executive functions. As it relates to pain, the prefrontal cortex is thought to encode the cognitive aspects of pain, such as memory for pain, evaluation of the meaning of pain, and executive decisions concerning what to do about pain (Apkarian, Bushnell, Treede, & Zubieta, 2005), which are then initiated with the help of the ACC and motor cortex. Also, research shows that activity in the prefrontal cortex is negatively associated with the severity of pain, consistent with the view of the frontal cortex as serving a generally inhibitory function, and a specific role for this area in the modulation of pain (Lorenz, Minoshima, & Casey, 2003).
Plasticity

In addition to causing both specific (i.e., targeting specific areas) and diffuse (across the whole brain) activity in the nervous system, nociception can produce physical changes in the brain; changes that affect the processing of future nociceptive input. For example, nociception can sensitize some of the cortical areas involved in pain processing so that they are more likely to become active in response to future nociception (Tinazzi, Fiaschi, Rosso, T., Faccioni, Grosslecher, & Aglioti, 2000; see review by Melzack, Coderre, Katz, & Vaccarino, 2001).

Nociception can also produce shifts in the relative importance of structures in the brain as they respond to and process future nociception. For example, activity in the prefrontal cortex becomes increasingly engaged and associated with the experience of pain as pain becomes more chronic (Apkarian, Bushnell, Treede, & Zubieta, 2005). This finding provides a neurophysiological rationale for something that clinicians have long known: for the adequate treatment of chronic pain, processes related to the prefrontal cortex, such as memories and the meaning of the pain in the context of the patient’s life goals, must be addressed. Plastic changes in the brain have also been found in patients with pain associated with amputation (Flor, et al., 1995; also see review by Elbert & Rockstroh, 2004), complex regional pain syndrome, type 1 (Maehler, Handwerker, Neundörfer, & Birklein, 2003; Pleger, Tegenthoff, Ragert, Förster, Dinse, Schwenkreis, et al., 2006), back pain (Apkarian, Sosa, Sonty, Levy, Harden, Parrish, et al., 2004; Flor, Braun, Elbert, & Birbaumer, 1997; see also Schmidt-Wilcke, Leinisch, Gänssbauer, Draganski, Bogdahn, Altmann, et al., 2006), and fibromyalgia (Kuchinad, Schweinhardt, Seminowicz, Wood, Chizh, & Bushnell, 2007).

As a group, these findings show that ongoing nociception and pain alters brain physiology and future pain processing. Unfortunately for persons with chronic pain, the changes that have been observed appear to lead to increases, rather than decreases, in pain and suffering. On the other hand, the fact that the nervous system shows changes in response to nociception and pain also opens the door to a number of treatment options such as hypnotic analgesia that might be able to reverse, or at least influence, CNS (dys)function.

Understanding the Neurophysiological Basis of Hypnosis and Hypnotic Analgesia

The improvements in neuroimaging technology have also facilitated research into the neurophysiological effects of hypnosis and hypnotic analgesia. One of the most important findings from this research is that the neurophysiological effects of hypnosis depends on the specific suggestions used. For example, effective hypnotic suggestions for decreased pain unpleasantness, but not pain intensity, have been shown to be associated with decreased activity in the ACC, but not S1 or S2 cortex (Rainville, Duncan, Price, Carrier, & Bushnell, 1997; see also Wik, Fischer, Bragée, Finer, & Fredrickson, 1999, who also found a decrease in activity in the cingulate cortex with hypnotic analgesia suggestions). On the other hand, effective suggestions for decreased pain intensity have been shown to be associated with decreased activity in the S1 cortex (and produce a similar trend in S2), but not the ACC (Hofbauer, Rainville, Duncan, & Bushnell, 2001).

Faymonville, et al. (2000) found that during the hypnosis, and relative to the other conditions, participants in a hypnosis condition undergoing painful stimulation had greater activity in the midcingulate portion of the ACC. Although the findings of Faymonville et al. (2000) differ to some extent from those of Rainville, Duncan, Price, Carrier, and Bushnell, M.C. (1997) and Wik, Fischer, Bragée, Finer, and Fredrickson (1999), cited above, who both found decreased activity in the ACC following hypnotic analgesia suggestions, Faymonville et al. (2000) argue that the findings as a group support the conclusion that the ACC plays an active role in pain modulation in hypnotic
analgesia; a conclusion consistent with the imaging research on the neurophysiological correlates of pain experience, cited above.

Using the design (and some of the subjects) used in their 2000 study, Faymonville and colleagues (Faymonville et al., 2003) next examined the functional connectivity between the midcingulate portion of the ACC and other brain areas during hypnosis. Connectivity was assessed as a correlation in activity (assessed by positron emission tomography) between the ACC and other areas of the brain physiologically connected to the ACC. In this study, they replicated the significant effects of their hypnotic intervention (relative to rest and to distraction) on pain. They also found an increase in connectivity with hypnosis in activity between the midcingulate ACC and the bilateral insula, the pregenual cingulate cortex, pre-supplementary motor area, right prefrontal cortex and striatum, thalamus, and brain stem. In other words, their hypnotic suggestion to re-live a pleasurable autobiographical event appeared to enlist activity in, and connectivity between, many of the areas that make up a critical cortical pain processing network.

Fingelkurts, Fingelkurts, Kallio, and Revonsuo (2007) compared cortical functional connectivity (assessed via correlations in EEG activity assessed over different scalp sites across a variety of frequency bandwidths) in a single highly hypnotizable individual between baseline and hypnotized conditions in two hypnosis sessions separated by a year. In apparent contrast to the findings of Faymonville et al. (2003), they found significant decreases in connectivity in activity (assessed as correlations in EEG activity across different bandwidths) assessed over a number of scalp sites following the hypnotic induction in both hypnosis sessions. Along these lines, Egner, Jamieson, and Gruzelier (2005) reported a decrease in functional connectivity (assessed via correlations in EEG gamma band activity) between the frontal midline and left lateral scalp sites in highly susceptible subjects after hypnosis during a Stroop task.

There is also evidence that hypnotic analgesia may be effective, at least in part, through its influence on activity at the level of the spinal cord. Support for this possibility comes from a variety of studies that demonstrate hypnotically induced reductions in skin reflex on the arm (Hernandez-Peon, Dittborn, Borlone, & Davidovich, 1960), nerve response in the jaw (Sharav & Tal, 1989), and muscle response in the ankle (Kiernan, Dane, Phillips, & Price, 1995). The study by Kiernan and colleagues (1995) may be particularly informative, as it demonstrated that suggestions for analgesia were correlated with the R-III (spinal nociceptive) reflex, a response that is not subject to voluntary control. Using a methodology similar to that of Kiernan, Dane, Phillips, and Price (1995), Danziger and colleagues (Danziger et al., 1998) later found two patterns of R-III reflex associated with hypnotic analgesia in 18 individuals with high levels of hypnotizability: eleven of their study participants showed clear inhibition and 7 showed facilitation of the spinal nociceptive reflex following hypnotic analgesia suggestions. Although the reasons for the differences in response are not easily explained, they do indicate that highly suggestible individuals can show changes in spinal nociceptive reflex when given hypnotic analgesia suggestions.

One additional study is of relevance for this section, and for helping to understand the effects of hypnosis on sensations. In this study, Derbyshire, Whalley, Stenger, and Oakley (2004) identified eight individuals who had high (>8) scores on the Harvard Group Scale of Hypnotic Susceptibility and who had been screened for their ability to experience pain, in response to hypnotic suggestions, without any noxious stimulation. fMRI images of brain activity were made in three conditions: (1) during actual noxious thermal stimulation, (2) following hypnotic suggestions for this same pain experience without stimulation, and (3) following a request that they imagine this pain without any hypnotic induction. Average pain ratings (on 0-10 scales) during noxious stimulation was 5.7, and the average pain ratings
in response to hypnotic suggestion was 2.8 (none of the participants reported that they experienced pain during the imagined pain condition). Similar brain areas became active following both noxious stimulation and hypnotic suggestions for pain, including the thalamus, ACC, midanterior insula, and parietal and prefrontal cortex. This research is striking in that it shows that hypnotic suggestions without physical stimulation can create reports of sensations (in this case, pain), and that the brain responds as if the sensations were real (see also Kosslyn, Thompson, Costantini-Ferrando, Alpert, & Spiegel, 2000, for similar findings concerning the perception of color). Of course, if people can create the sensation of pain, they can create other sensations as well, including sensations that are much more comfortable.

Does hypnosis and hypnotic analgesia increase or decrease cortical connectivity? Does it increase or decrease activity in the ACC? Does it inhibit or facilitate spinal reflexes? If the research findings that have been reported to date are replicated in future studies, then a reasonable conclusion is that hypnotic analgesia can do all of these things, depending, perhaps, on the specific suggestions used, the characteristics of the individuals being studied, and the specific neurophysiological effects and sites being examined. Concerning connectivity, for example, it is possible that responses to some hypnotic suggestions (e.g., to re-live a pleasurable experience, as suggested by Faymonville and colleagues) require more connectivity between some brain areas in order to effectively reduce pain, while responses to other suggestions (e.g., suggestions to “let go,” which is a common part of many hypnotic inductions) require decreased connectivity between some cortical areas in order to be effective. Similarly, some hypnotic suggestions (e.g., to decrease the affective or bothersomeness quality of pain) may require a global decrease in ACC activity to be effective, while others (e.g., to experience more pleasure related to memories of positive experiences) may require an increase in ACC activity.

One conclusion from this research is clear: “hypnotic analgesia” is not a single treatment that affects pain via a single underlying physiological mechanism. Instead, different hypnotic suggestions appear to affect pain experience via their effects on different neurophysiological processes and sites. This observation raises the intriguing possibility that the efficacy of hypnotic analgesia interventions might be maximized by including suggestions that address multiple underlying physiological areas and processes; not just, for example, those areas related to the sensory (somatosensory cortex) or affective (ACC) domains of pain.

Implications for Clinical Applications of Hypnotic Analgesia

Given the strong evidence for the efficacy of hypnotic approaches (Jensen & Patterson, 2006; Montgomery, DuHamel, & Redd, 2000; Patterson & Jensen, 2003), as well as evidence that the “side effects” of hypnotic analgesia are overwhelmingly positive (Jensen & Patterson, 2006), clinicians would do well to consider providing hypnotic treatments for any individual suffering from acute or chronic pain who expresses an interest in this approach. However, there is not yet a strong research base for understanding which hypnotic interventions or suggestions are most effective overall, or if some suggestions are more effective for some conditions than others. Until such research is performed, clinicians could use what is known about pain neurophysiology to help guide their use of hypnotic analgesia.

As described above, the experience of pain is associated with activity in the periphery, the spinal cord, a number of specific supraspinal areas, a general increase in cortical activity, and plasticity (changes in cortical structures). Changes in cortical connectivity have also been shown to be associated with hypnosis and hypnotic analgesia. The variety of neurophysiological processes associated with the experience of pain may explain, at least in
part, why so many psychological interventions effectively reduce pain for so many people; the target (of brain areas and processes associated with pain experience) is rather large, and hard to miss. The knowledgeable pain clinician can take advantage of the complexity of these processes when helping his or her clients learn to better manage pain.

Table 1 lists nine nervous system sites and neurophysiological processes that can contribute to the experience of pain, along with types of hypnotic suggestions that could potentially influence activity at those sites or within those processes (see also chapter on pain management in Hammond [1990] for a large number of additional hypnotic suggestions and strategies for pain control). Most, but not all, of the types of suggestions listed have been described in hypnotic analgesia case reports and clinical trials, although the suggestions described in these studies show a tendency to focus on just one or two types of suggestions with any one client or in a clinical trial.

Conclusions concerning the actual neurophysiological mechanisms affected by the suggestions listed in Table 1 must await research that addresses the site(s) of activity of these different suggestions; we cannot assume that any reductions in pain resulting from the suggestions listed in Table 1 always and necessarily have their effects via the one specific site or process that they are listed next to. For example, it is possible that suggestions designed to target pain intensity could influence pain via: (1) decreases in activity in the somatosensory cortex; (2) activation of the PAG, which could then produce a decrease in the responsivity of the STT cells in the dorsal horn via descending inhibition; (3) decreases in activity in the ACC and insula; (4) decreases in connectivity; or (5) some combination of these or other mechanisms. It is also possible that the specific mechanisms that underlie the same suggestion differ from one individual to another. However, even though we cannot conclude at this point that the suggestions listed in Table 1 necessarily have their analgesic effects by causing changes in the sites or processes they are listed with in Table 1, the sites and processes listed do provide the clinician with a way of organizing the kinds of hypnotic analgesia suggestions that they might consider when working with a client with pain.

Suggestions related to a goal of decreasing diffuse cortical activity

One primary effect of nociception is a general increase in cortical activity. To address this effect, it can be helpful to provide patients with suggestions for being able to create for themselves a sense of global calm. This can be accomplished by providing direct hypnotic suggestions for relaxation or other commonly used suggestions that contribute to a sense of general comfort. Many, if not most, clinicians who use hypnosis for pain problems provide suggestions for relaxation, often as a part of the initial induction (e.g., Abrahamsen, Baad-Hansen, Svensson, in press; Crasilneck, 1995; Jack, 1999; Lu, Lu, & Kleinman, 2001; Montgomery, Bovbjerg, Schnur, David, Goldfarb, Weltz, et al., 2007; Simon & Lewis, 2000; Spinhoven & Linssen, 1989).

A suggestion to create and then experience being in a “special place” (that is, a place that is beautiful, safe, relaxing, and calming to the client) can also achieve this goal (see Abrahamsen et al., in press, and Lang, et al., 2006, for examples of use of “safe place” suggestions as a component of hypnotic pain management). Almost all individuals, regardless of their global hypnotizability, report that they experience relaxation inductions as comforting and calming, and some (although not the majority), report substantial decreases in their experience of pain that can then last for hours following this induction alone. The ability to achieve a sense of general calm, through these or other suggestions, should be considered a key skill that should be taught to any individual who experiences pain.
Suggestions related to a goal of decreasing peripheral activity

There is some evidence that hypnotic suggestions can influence the chemical, inflammatory and other peripheral physiological processes that affect the responsivity of nociceptors. In one early study, Chapmen, Goodell, and Wolff (1959) gave subjects hypnotic suggestions for one arm being “normal” or “anesthetic” (“numb” and “wooden”), or suggestions for one arm being “normal” and the other being “vulnerable” (“painful,” “burning,” “damaged,” and “sensitive”). They then exposed each arm to noxious thermal stimulation. Of the 12 times they compared responses between arms in the “normal” versus “anesthetic” condition, they found a greater increase in Bradykinin (a vasodilator associated with increased pain) content in the perfusate from a “vulnerable” arm than an “anesthetic” arm.

Also, the fact that hypnotic suggestions can affect spinal reflexes (Danziger, et al., 1998; Kiernan, Dane, Phillips, & Price, 1995), peripheral vascular activity (Casiglia, et al., 1997; Klapow, Patterson, & Edwards, 1996) and objective measures of wound healing (Ginandes, Brooks, Sando, Jones & Aker, 2003) can be taken as additional support for the conclusions that peripheral processes can be influenced by hypnotic suggestions. Thus, suggestions to decrease nociceptor responsivity in the periphery (see Table 1 for examples) should at least be considered and tried; and of course maintained in future treatment sessions and included in practice recordings for those patients who respond well to such suggestions.

Suggestions related to a goal of decreasing STT (dorsal horn and thalamus) activity.

The STT cells in the dorsal horn are affected by both ascending and descending factors. To stimulate memories of the effects of ascending factors, it could be suggested that the patient experience any one of a number of peripheral sensations that are known to modulate STT cells via ascending inhibitions (see Table 1 for examples). Other suggestions could be used to stimulate possible descending inhibitions, such as suggestions to “turn down the volume” on any experiences of discomfort (Table 1).

Suggestions related to a goal of decreasing activity in the somatosensory cortex activity.

The S1 and S2 cortices encode information about pain intensity, location, and quality. Suggestions associated with these domains of pain are perhaps the ones most commonly described in hypnotic analgesia case reports and clinical trials, and include direct and indirect suggestions to affect each of these three pain domains (see Table 1).

Suggestions related to a goal of decreasing activity in the insula.

The insula has been suggested as the area of the limbic system responsible for encoding how a person feels physically with respect to homeostasis, including the overall presence and severity of pain, thirst, hunger, and air hunger, as well as more positive physical experiences such as sensual touch (Craig, 2003, in press). The goal with hypnotic suggestions related to these processes would be to “fill the insula” with pleasurable and calming physical sensations. When successful, such suggestions would be accompanied by a sense, not only of reduced pain, but of significant feelings of “relief,” which could then contribute to an overall sense of comfort and calm.

The relaxation suggestions discussed above, to encourage the patient to “feel” physically relaxed, and that are often a part of hypnotic inductions, achieve this goal. Other suggestions related to pleasurable physical feelings, such as feelings of a comfortable warmth or coolness (it is often a good idea to suggest that patients feel “just the right temperature” because sometimes people would feel more comfortable feeling cooler and sometimes feeling warmer) or memories of being physically comfortable can also achieve this. Such sensations, of course, are incompatible
with severe pain, so could contribute to a sense of homeostasis (perceived relief, comfort, and physical safety; see Table 1).

Suggestions related to a goal of decreasing activity in the ACC

The ACC has been proposed as being important for addressing and facilitating the motor aspects of the limbic system (Craig, 2003, in press). Suggestions to address this component of pain would include suggestions relating to a decreased need to do anything in response to feelings of discomfort (see Table 1). Alterations in this component of pain may explain, at least in part, the benefits of acceptance approaches to chronic pain treatment (McCracken & Vowles, 2006). However, suggestions to address the motor dimension of pain, or at least the compulsion to reduce pain, are rarely described in the in hypnotic analgesia literature.

Suggestions related to a goal of altering activity in the prefrontal cortex

Because nociception directly activates executive processes related to the meaning of pain, memories of pain, and the implications of pain for future functioning, excluding suggestions to address these processes limits the benefits that patients could potentially obtain from hypnotic analgesia treatments. Suggestions that the chronic (old, not any new) sensations have no meaning for the patient’s physical well being (providing, of course, that the patient has been carefully evaluated from a medical perspective, with the finding that the chronic pain sensations can safely be ignored) can be very useful (see Table 1). When providing such suggestions, it might be useful to include suggestions that any new sensations, that might have implications for the patient’s health and physical well being, can be noted, and appropriate action taken to “… address your health… whatever action is most appropriate for your wellness.”

The clinician may also bring into the suggestions ideas about the patient’s values and life goals, and link them to what is known about adaptive pain coping (e.g., maintaining an appropriate level of activity, focusing on life goals other than just pain reduction, increasing participation in distracting and healthy activities, appropriate activity pacing), and adaptive pain attributions (see Dane, 1996; Patterson & Jensen, 2003). To the extent that any experience of pain is associated with memories that contribute to pain and suffering, links to more comforting memories via age regression can be created (see, for example, Crasilneck, 1995; Lu, Lu, & Kleinman, 2001; and Abrahamsen, R., Baad-Hansen, L., & Svensson, P., in press). Age progression is yet another way to associate new, comforting images and feelings to sensations that had previously been interpreted as pain, but that are hopefully becoming, with treatment, increasingly associated with relaxation, comfort, and/or a sense of “an interesting challenge to be dealt with” (as opposed to something to panic about).

This aspect of pain is the primary target of traditional cognitive restructuring approaches to pain management (Turk, 2002; Turk, Meichenbaum, & Genest, 1983). However, cognitive restructuring is not usually applied following hypnotic inductions; this intervention seeks to engage patients directly, while they are in a non-hypnotic state, in the logical process of identifying and stopping maladaptive thoughts (which can be viewed as a type of self-suggestion) and developing more adaptive and realistic thoughts to replace the old ones (Ehde & Jensen, 2004). Cognitive restructuring has proven efficacy (Hoffman, Papas, Chatkoff, & Kerns, 2007), and should be considered as a part of treatment when working with an individual with pain. However, hypnosis can be used to help identify adaptive cognitive responses and attributions, as well as to experience, during hypnosis (i.e., not just imagine or think about) what it would be like to live with new adaptive thoughts.
Suggestions related to a goal of altering cortical connectivity

As was noted above, research suggests that connectivity—the functional association between different brain areas and processes—can be both enhanced and disrupted by hypnotic suggestions, perhaps as a function of the specific suggestion(s) made and the neurophysiological processes required to respond to those suggestions. To the extent that the perception of pain requires connectivity between different components of the cortical networks, then suggestions to disrupt this connectivity could presumably disrupt the experience of pain. A number of examples of such suggestions exist in the literature, including suggestions to dissociate from the experience of pain, almost as if it were in another person’s body (Botta, 1999), or to experience oneself as separating from one’s body (e.g., as “floating”; see Lang et al., 2006; see also Abrahamsen et al., in press; Jensen, et al., 2005; see Table 1).

Suggestions relating to plasticity

The cortical changes that are known to occur in persons with acquired amputation and CRPS-1, and that are related to chronic pain, can be reversed by interventions which increase activity and normal use of the S1 cortex associated with the painful area (Flor, Denke, Schaefer, & Grüsser, 2001). Hypnosis can be used to facilitate this, by suggesting to patients with phantom limb pain or CRPS-1 that they experience their affected limbs as moving comfortably and normally (Muraoka, Komiyama, Hosoi, Mine, & Kubo, 1996; Oakley, Whitman, and Haligan, 2002; Rosén, Willoch, Bartenstein, Berner, & Røsjø, 2001). Such suggestions can easily be incorporated into any hypnotic analgesia treatments that also include the other suggestions listed above. But such suggestions need not be limited to persons with phantom limb pain or CRPS-1 (see Dane, 1996, for an example of the use of this type of suggestion in a patient with MS). Asking patients to experience themselves as moving comfortably and easily presumably produces cortical activity and connections associated with pain-free movement. To the extent that such activity produces physiological changes that effect future cortical responses to movement, it is likely that those changes would be positive ones.

It is not clear whether the decreases in the density of gray matter in the dorsolateral prefrontal cortex that have been noted in persons with low back pain and fibromyalgia can be reversed via hypnosis or other means. The only explanation put forth so far for this decrease is that this area is chronically activated as a part of the brain’s attempt to modulate the pain, and this “overuse” leads to the release of toxic chemicals and subsequent gray matter loss (Apkarian, et al., 2004). One might speculate that a clinician could help create a “rest” for the prefrontal cortex—a decreased need for it to make ongoing efforts to modulate pain—by using one of the several suggestions listed above (for example, by altering the sensory qualities of pain or dissociating the sensory qualities of pain from the emotional responses to any pain experienced; or by encouraging the idea that the person need not “do anything” in response to pain), which might at least stop or slow the process of density loss. We do know that gray matter, at least in the parietal cortex, can be increased with learning (Draganski, et al., 2006). Whether or not some other similar mechanism, perhaps enhanced by hypnotic approaches, can be used to stop, slow, or reverse the cortical density loss in dorsolateral frontal cortex remains to be seen.

It is almost always the case that hypnotic analgesia treatment should include post-hypnotic suggestions to help make any and all benefits obtained with hypnosis permanent (Jensen & Patterson, in press). Given the evidence that nociception and the experience of pain can have detrimental effects on brain physiology and activity that are lasting, it is certainly possible that hypnotic interventions can have beneficial effects on brain physiology and activity, and that these changes can also be lasting. Thus, hypnotic analgesia sessions
should usually end with post-hypnotic suggestions that any benefits obtained from the session will last (see Table 1).

**Summary and Conclusions**

The complexity of the neurophysiological processing of pain means that there should be many ways and types of suggestions that will influence the experience of pain. Each of these types of suggestions should at least be considered, if not tried, with every patient. Through systematic application of these suggestions, and then continued use of those suggestions found to be most effective with any one patient, treatment efficacy for every patient can be maximized. More research will show which nervous system areas and processes are most responsive to hypnosis in general and to specific hypnotic analgesia suggestions in particular, and how these might differ as a function of patient characteristics (e.g., hypnotizability, pain diagnosis). The findings from this research will help guide future clinical work. But clinicians need not wait for the results of this research to practice state-of-the science clinical care. They can begin now, by expanding the suggestions they use to address all pain-related processes, in order to maximize the benefit their clients will achieve in getting control over pain and its effects on their lives.
### Table 1: Hypnotic suggestions or approaches for pain management and possible site(s) of action (see text for discussion).

<table>
<thead>
<tr>
<th>Neurophysiological site(s) or problem</th>
<th>Goal(s) of suggestion(s)</th>
<th>Examples of suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse cortical activation</td>
<td>Generalized calm</td>
<td>“Allow your mind to be aware of the muscles and tendons in the [state body part or area], and allow those muscles and tendons to relax...let go...noticing whatever sensations that let you know that the muscles are relaxing. Perhaps a sense of heaviness...or warmth...or a sense of lightness...I don’t know what sensations you will experience, as the [body part or area] feels more and more relaxed...more and more comfortable...with every breath you take...and now, those feelings of relaxation move to the [next body part or area, until the entire body is covered].”...and in your mind’s eye, you can picture yourself moving down a path, to a safe and comfortable place...a place you might have been before...or a place that you create for yourself...[continuing with suggestions that will allow the client to experience details of the place, including sensory experiences as well as references to safety and control].”</td>
</tr>
<tr>
<td>Periphery</td>
<td>Experience peripheral analgesia</td>
<td>“The area of pain and discomfort is being engulfed in a psychological anesthesia....” (Crasilneck, 1995, p. 260), or glove anesthesia and transfer of sensations with glove anesthesia to peripheral areas.</td>
</tr>
<tr>
<td></td>
<td>Produce the experience of decreased nociceptor responsivity</td>
<td>You can “... begin to reduce the oversensitivity by pouring soothing, healing fluid down the affected nerves to help them.” (Williamson, 2004, p. 148).</td>
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Note: STT=Spinal Thalamic Tract; ACC=Anterior Cingulate Cortex
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<th>Goal(s) of suggestion(s)</th>
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<tbody>
<tr>
<td>STT (dorsal horn and thalamus)</td>
<td>Experience sensations that ascending STT cell inhibition such as warm or cool sensations.</td>
<td>“...your body, your spine, knows that when you rub a body part it overwhelms the spine with comfortable sensations, that displace any other sensations...and you can take advantage of that ability...imagining that someone is rubbing, massaging the part that is sometimes uncomfortable...feeling that relaxing massage...and noticing how it replaces any feelings of discomfort.” (Sacerdote, 1978, p. 20). “...Picturing yourself in a room that is just too bright...so you go over to the dimmer switch, and turn the knob...dimming the lights” (see also “master control room” metaphor used by Gainer, 1992). “Your brain is now sending messages to the gate-control stations to tune down the intensity and quality of the pain signals, so that you will feel less and less discomfort...”</td>
</tr>
<tr>
<td></td>
<td>Experience or produce activities that reflect descending STT cell inhibition.</td>
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<td></td>
<td>Metaphors and images related to the inhibition of flow.</td>
<td></td>
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<tr>
<td>Somatosensory cortex</td>
<td>Decreasing pain intensity</td>
<td>“Now the pain in your right hand is beginning to lessen, the pain is subsiding; the pain is decreasing. With every breath you take, the pain in your right hand is diminishing; less pain...Lessening, decreasing, and almost gone” (Crasilneck, 1999, p. 259), or “I can’t take away all of your pain...it is asking too much of your body. ...And if you lose 1%...you would still have 99% of it left, but it would still be a loss of 1%. You could lose 5 percent of that pain. You wouldn’t notice the loss of 5% because you would still have 95% of the pain; but you would still have a loss of 5%...You might even lose 80% of your pain, but I don’t think that is quite reasonable yet. I would be willing to settle for a loss of 75%...what is the difference between 75% and 80%, and sooner or later you can lose 80%, and maybe 85% but first, let us settle for 80%.” (Erickson, 1983, p.236).</td>
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<tr>
<td>Alter the pain site</td>
<td>“Now, you’ve got cancer pain. Why not have another kind of pain also? Why not have pain out here in your hand? You have cancer pain in your body. It is very, very troublesome; it is very, very threatening...You wouldn’t mind any amount of pain out here in your hand...And if you had pain out here you could stand any amount...” (Erickson, 1986, p. 80; Jack, 1999; Spinhoven and Linssen, 1989).</td>
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<td>Alter pain extent</td>
<td>“The area of any discomfort is shrinking, becoming smaller and smaller, actually shrinking, to the size of a hand...a palm...a band-aid...a button...a tiny tiny speck...so small...hardly noticeable at all.”</td>
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<td>Alter pain quality</td>
<td>“…substitute a different feeling, such as numbness or warmth, or tingling or pressure, for any unpleasant sensations...you may already be feeling different sensations – sensations that slowly and easily take the place of any uncomfortable feelings...” (Jensen et al., 2005, pp. 208-209), or “…This short, cutting, stabbing, blinding pain of yours, could you make that into a dull, heavy pain?” [and then transform this into a feeling of relaxation and weakness] (Erickson, 1980, p. 318), or “If you will just pay attention to that grinding pain you will notice that it is a slow grinding pain” (Erickson, 1983, p. 227; Abrahamsen, et al., in press).</td>
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<td>Metaphors that alter the sensory aspect of pain</td>
<td>“And you can picture the discomfort as a picture, a figure, or an image...that’s right...and now notice as the size, color, location, or other aspect of the image changes, or you might even imagine” or “…You can picture putting these feelings in a box, then putting this box into another box, and then putting this box in yet another box, and placing that box in a room down a long hallway.” (Jensen et al., 2005, p. 206; Abrahamsen et al., in press; Erickson, 1967; Jack, 1999; Gainer, 1992; Spinhoven &amp; Linssen, 1989).</td>
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<tr>
<td>Neurophysiological site(s) or problem</td>
<td>Goal(s) of suggestion(s)</td>
<td>Examples of suggestion</td>
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<tr>
<td>Insula</td>
<td>Experiencing comfortable bodily sensations (relaxation, warmth, lightness, etc.)</td>
<td>“And in your special place, you can feel a breeze, it might be cool...or warm...it is just the right temperature...it just feels so good,” or lightness, etc.). “As you lower yourself into the healing water...you might feel a tingling...the feeling of the water around you...and the temperature...it is just right for you right now...pleasantly warm or cool...I don’t know what would feel the best to you now...but you do...and the water...so relaxing...filling your body with a sense of comfort...such relief...you might feel yourself wanting to sigh...a sign of relief...”, or “…now just feel the shawl and drape it around yourself...feel the snugness and how it is protecting you...feeling warm and snug trapping all the warm air...” (Jack, 1999, p. 235), or “Now as I talk and I can do so comfortably. I wish that you will listen to me comfortably...it’s so comfortable Joe to watch a plant grow...” (Erickson, 1966, pp. 203-204). “Remembering a time when you just felt so good, physically. Maybe you were getting a massage, maybe it was when you were running, comfortably, easily, and strongly...feeling so good...muscles relaxed, really feeling that way, right now.” “…And know that you and your body are safe...the body knows...what to do to heal itself...there is no need for you to do anything more, other than what any person requires to maintain their health and comfort...you can just relax and accept that you will feel more and more comfortable.”</td>
</tr>
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</table>

<p>| ACC                                  | Experiencing a feeling of “not caring” about the pain - a feeling of not having to do anything about it. | Age regression to the experience of physical sensations incompatible with pain |</p>
<table>
<thead>
<tr>
<th>Neurophysiological site(s) or problem</th>
<th>Goal(s) of suggestion(s)</th>
<th>Examples of suggestion</th>
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<tbody>
<tr>
<td></td>
<td>Amnesia for pain to reduce recall of distress and dread of future pain</td>
<td>“The explanation was offered that, in amnesia for pain, one could experience pain throughout its duration, but would immediately forget it and thus would not look back upon the experience with a feeling of horror and distress, nor look forward to another similar pain experience with anticipatory dread and fear. (Erickson, 1959, p. 70)</td>
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<td></td>
<td>Altering the meaning of pain</td>
<td>“Pain...is no cause for undue alarm...it [can] reasonably be put into the background, much as noisy children are invited to play in a room with the door closed where they can be responded to if necessary, but otherwise ignored.” (Dane, 1996, p. 233).</td>
</tr>
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<td></td>
<td>Focus on valued goals other than pain reduction</td>
<td>“As you are able, more and more, to ignore feelings of discomfort, you are free to consider other things, and to move towards your own important life goals, perhaps goals related to what you want to do with your family...your children...you are now free to grow...to leave discomfort behind,” or “While you’re thinking about this or that particular happy thing, you won’t have enough energy left over with which to feel the pain of your cancer because all of your energy is going to go into this matter of thinking over all the nice things...” (Erickson, 1983, p. 318).</td>
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<td></td>
<td>Focus on physical activity and fitness</td>
<td>“To create for yourself a healthy lifestyle...in the ways that are just right for you...being appropriately active...choosing and maintaining the exercises that fit with your goals and life...feeling so good about how in control you are...of your body...your health...your life.”</td>
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<tr>
<td>Neurophysiological site(s) or problem</td>
<td>Goal(s) of suggestion(s)</td>
<td>Examples of suggestion</td>
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<tr>
<td>Age regression to experience memories of comfort</td>
<td>“And you can think back to a time when you felt so very comfortable... and remember what that felt like... in body... in mind... where are you? what are you doing?... you are there... really there... notice what is around you... and how you feel... really experience that comfort... in every nerve, every muscle, every tendon. Are you experiencing this now? Good... and now, remember this... allow the mind to bookmark this state. You can come back, now, to the here and now..., but bring this comfort with you.”</td>
<td>“And now... you can see yourself sometime in the future... maybe later today... tomorrow... next week... even months from now... feeling so much better than you do now. So confident in your ability to live the life you want, no matter what sensations you experience, to do what you want and need to do, comfortably, with a sense of relaxation and purpose... and thinking thoughts that reflect this confidence and comfort. Just filled with optimism and hope... a confidence that you can manage and move forward... you feel good physically... and emotionally. So relaxed... yet strong... so calm. I wonder what thoughts are going through your head that reflect these feelings? Positive, realistic, and reassuring thoughts... you may remember some of these thoughts... yes, that one... and you will be able to tell it to me later... and now, as you come back to the here and now, you are bringing back with you some, or much, or all... you choose how much... of these feelings, these thoughts, with you... bring them right back with you as a part of your brain and body... so you can experience them here and now... and the rest of today, and tomorrow...” (Spinhoven &amp; Linssen, 1989).</td>
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<tr>
<td>Neurophysiological site(s) or problem</td>
<td>Goal(s) of suggestion(s)</td>
<td>Examples of suggestion</td>
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<td>Cortical connectivity</td>
<td>Experiencing oneself as distant from one’s body</td>
<td>“The body is so relaxed…you even lose awareness of some parts, almost as if they were becoming thinner and thinner, or disappearing altogether…and as the body disappears, perhaps you experience yourself as a point of consciousness…floating…just floating in space…the body far below…you are just pure consciousness completely separate from the body.”</td>
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<tr>
<td>Plasticity</td>
<td>Experiencing the painful area as able to move comfortably and easily</td>
<td>Disconnect sensations from an emotional response</td>
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<td></td>
<td>Post-hypnotic suggestions to make any benefits permanent</td>
<td>“And as you experience yourself in this comfortable place, you can also observe your arm moving, naturally, and easily… the arm is bending…the fingers are moving…and now, lifting that weight… feeling the arm move…making it move…getting stronger and stronger…”</td>
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<td>All benefits that you have obtained from the session today, and your use of it for self-hypnosis in your daily life…those benefits can become…more and more…a permanent part of how your brain works…so that any time the brain can automatically and easily…without you even having to think about it…move itself into a state that allows for comfort and relaxation…just like the more you learn to do anything, driving, walking [insert appropriate examples from the patient’s own life], the more automatic it becomes…automatic, freeing you up to do whatever else you want to do…to talk…to listen…to enjoy the moment…to really be with family and friends…what your brain is learning, and to the extent that it brings you comfort and a greater sense of control, then, is becoming more and more a permanent part of who you are…of how your brain works.”</td>
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References


**Author Note**

The inspiration for the premise of this article — that is, that it would be useful for clinicians to consider wording suggestions to address underlying physiology — came from Daniel Handel in a conversation he had with the author on May 4, 2007. This research was supported by the Hughes M. and Katherine G. Blake Endowed Professorship in Health Psychology.
Topical review

Hypnosis for chronic pain management: A new hope

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1. Introduction

Hypnosis can be defined as an induction followed by a suggestion (or set of suggestions). The induction usually consists of “…an extended initial suggestion for using one’s imagination” [p. 262, [14]], or an invitation to focus one’s attention, and is thought to make the hypnotic subject more receptive to suggestions. An induction can take several seconds or up to 10 minutes or longer, depending upon the clinician’s usual practice and the hypnotic subject’s response. The suggestions that follow the induction usually include “…suggestions for changes in subjective experience, alterations in perception, sensation, emotion, thought, or behavior” [p. 262, [14]]. Documented use of hypnosis for pain management extends back to the 1840s, when John Elliotson (1791–1868) reported using “mesmeric sleep” as an effective anesthetic during surgery [10].

Although hypnotic analgesia is among the oldest treatments for pain, interest in its use seems to wax and wane. Currently, interest in hypnotic treatments for chronic pain appears to be on the rise, possibly due to (1) confirmation from imaging studies that chronic pain is largely influenced by, and may at times be primarily the result of, supraspinal neurophysiological processes; (2) evidence that hypnosis has observable influences on the neurophysiological processes associated with pain; and (3) empirical confirmation that hypnotic analgesia is effective for chronic pain management. The purpose of this topical review is to provide a brief summary of the key findings in these three areas and summarize some innovative new directions in the field.

2. The experience of chronic pain is the result of complex interactions between multiple supraspinal CNS sites

Early research on the neurophysiological underpinnings of pain focused on peripheral activity emanating from the site of injury. Some of that focus shifted to the spinal cord after the introduction of the gate control theory [21]. With recent improvements in imaging technology, there has been a dramatic increase in the study of the central neurophysiological correlates of pain. As a result, we more fully understand how the experience of pain is directly associated with multiple integrative and interlocking neurophysiological mechanisms and sites, with supraspinal sites playing a key role. The supraspinal sites most commonly linked to pain include the thalamus, the insula, the primary (S1) and secondary (S2) sensory cortices, the anterior cingulate cortex (ACC), and the prefrontal cortex [2,6]. The fact that so many CNS sites, structures, and processes contribute to pain gives the clinician a large variety of interventions to choose from, including psychological interventions that affect cortical activity, such as hypnosis [16].

3. Imaging evidence demonstrates that hypnosis has direct effects on many supraspinal sites involved in the experience of pain

Research published in the last decade demonstrates that hypnosis and hypnotic suggestions impact activity in many of the CNS sites associated with pain. One study, for example, has shown that suggestions for feeling pain in the hand in healthy and (initially) pain-free individuals resulted in both (1) reports of pain and (2) increased activity in the thalamus, ACC, insula, prefrontal, and parietal cortices [7]. This study also showed that the effects of suggestions on both pain intensity and cerebral activation were stronger when the suggestions followed a hypnotic induction than when participants were asked to simply “imagine” pain without a hypnotic induction. Research also demonstrates that it is possible to increase the intensity of pre-existing (chronic) pain with suggestions (see below) [8].

Presumably, if hypnotic suggestions can produce pain and increases in pain-related cortical activity, they might also be able to produce pain relief and decreases in activity in these same brain areas. In a follow-up study, Derbyshire and colleagues suggested to individuals with chronic pain that they would experience their clinical pain as being of “low”, “medium”, and “high” intensity, both following and not following a hypnotic induction [8]. Changes in pain intensity reports and pain-related brain activity occurred in both the hypnotic and nonhypnotic conditions, consistent with the suggestions. That is, suggestions for high pain resulted in increases in pain and increases in cortical activity associated with the experience of pain, whereas suggestions for low pain resulted in decreases in pain and decreases in cortical activity in these same areas. Moreover, as was shown in their earlier study [7], the suggestions had larger effects following a hypnotic induction.

Two additional studies showing changes in pain-related brain activity following hypnotic suggestions for pain relief are of particular relevance to this topical review [15,25]. In the first, Rainville and colleagues demonstrated that hypnotic suggestions for decreased and increased pain unpleasantness succeeded in reducing and increasing ratings of pain unpleasantness, respectively.
did not affect ratings of pain intensity [25]. Consistent with the self-report findings, these same hypnotic suggestions resulted in decreases and increases in activity in the ACC (a part of the limbic system that is associated with emotional responding), but not other cortical areas (such as S1 and S2 cortices, which process sensory information, but not necessarily the emotional response to those sensations). In a follow-up study, the same group reported that hypnotic suggestions for increases and decreases in pain intensity were associated significantly with increases and decreases in activity in the S1 cortex (and a trend in S2), but not in the ACC [15]. Together, these two studies demonstrate that hypnotic suggestions can selectively alter the pain experience and have “targeted” effects on different cortical areas.

4. Recent clinical trials support the efficacy of self-hypnosis training for chronic pain management

Prior to 2006, there were only 13 randomized controlled trials of hypnosis treatment for chronic pain problems, and the majority focused on headache [20]. Control treatments included both active treatment control conditions (e.g., physical therapy and biofeedback) and no treatment or standard care conditions. Since 2006, four additional controlled trials have been published [1,13,17,18]. The primary findings from these additional trials are presented in Table 1.

As with the earlier work [20,23], the recent studies demonstrate that hypnosis was either as effective or more effective than other active treatments, and more effective than no treatment or standard care [20,23]. The four recent studies included making an audio recording of treatment sessions, and participants were encouraged to use these recordings for practicing self-hypnosis at home. Two of the studies also included encouraging participants to practice self-hypnosis without the audio recordings. [17,18] In the latter studies, and at follow-up, many more individuals reported practicing self-hypnosis both with and without the audio recordings than obtained clinically meaningful decreases in daily pain intensity. Specifically, 60–85% reported continued use of the audio recordings and 62–80% reported that they continued to practice self-hypnosis on their own without the recordings. However, only 22% of the participants with spinal cord injury and 47% of the participants with multiple sclerosis reported clinically meaningful (greater than 30% decrease) improvements in daily pain intensity. Participants also reported that when they practiced self-hypnosis, they experienced pain relief that would last for several hours. One possible explanation for the frequent use of self-hypnosis at follow-up, despite the lack of marked decreases in average daily pain for a number of the participants, is that treatment with self-hypnosis training may produce two types of benefits: (1) a significant decrease in chronic daily pain that maintains for up to a year [19] for a subset of patients and (2) the availability of a skill that can be used by the majority of patients to produce temporary pain relief, even if permanent changes in average daily pain intensity are not always obtained.

5. New directions: enhancing the efficacy of hypnosis for chronic pain management

Hypnosis rarely provides a cure for chronic pain. For those patients whose pain experience is related to neurophysiological processes that can be influenced by hypnotic suggestions, a marked decrease in pain intensity can be expected. Although a subgroup of these individuals will report maintenance of treatment benefits over the long term, there are also individuals who do not respond to hypnosis. Three possible strategies for enhancing the efficacy of this treatment approach include (1) using virtual reality hypnosis, (2) combining hypnosis with EEG-biofeedback (neurofeedback) training, and (3) providing self-hypnosis training much earlier in the course of the development of a chronic pain problem.

Virtual reality (VR) technology provides a three-dimensional computer-generated environment to the participant, allowing him or her to dissociate from the actual environment. VR can be extremely absorbing, and has been shown to be effective for reducing acute pain associated with medical procedures [27]. Patterson and colleagues recently noted the similarities between the subjective experience (of absorption) produced by VR and that produced by hypnosis [24]. Unlike hypnosis, however, response to VR treatment requires very little effort, and is not related to hypnotic ability. Thus, it is possible that VR could be used to induce hypnotic-like states that make individuals more receptive to suggestions, including individuals who might not otherwise respond to hypnosis. A case study recently demonstrated the efficacy of such an approach for chronic pain management [22]. Moreover,

Table 1
Randomized-controlled trials of hypnotic analgesia for chronic pain published since 2005.

<table>
<thead>
<tr>
<th>Author(s) and date</th>
<th>Diagnosis (N)</th>
<th>Experimental conditions</th>
<th>Number and length of sessions</th>
<th>Assessment points</th>
<th>Outcome dimension(s)</th>
<th>Primary finding(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrahamsen et al. (2008) [1]</td>
<td>Idiopathic orofacial pain (41)</td>
<td>Hypnosis (H); Relaxation (R)</td>
<td>5 1-h sessions</td>
<td>Pre-tx; Post-tx</td>
<td>Pain intensity (VAS)</td>
<td>H &gt; R</td>
</tr>
<tr>
<td>Granthorn and Ross (2008) [12]</td>
<td>Chronic widespread pain (16)</td>
<td>Hypnosis (H); Wait-List (WL)</td>
<td>10 30-min sessions</td>
<td>Pre-tx; Post-tx</td>
<td>Composite “symptom” score (e.g., pain, fatigue pain interference)</td>
<td>H &gt; WL</td>
</tr>
<tr>
<td>Jensen et al. (2009) [17]</td>
<td>Multiple sclerosis and chronic pain (22)</td>
<td>Hypnosis (H); Progressive Muscle Relaxation (PMR)</td>
<td>10 1-h sessions</td>
<td>Pre-tx; Post-tx; 3-months</td>
<td>Pain intensity (NRS)</td>
<td>H &gt; PMR</td>
</tr>
<tr>
<td>Jensen et al. (2009) [18]</td>
<td>Spinal cord injury and chronic pain (37)</td>
<td>Hypnosis (H); EMG biofeedback relaxation (EMG)</td>
<td>10 1-h sessions</td>
<td>Pre-tx; Post-tx; 3-months</td>
<td>Pain intensity (NRS)</td>
<td>H &gt; EMG</td>
</tr>
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</table>

Note: VAS, visual analog scale; MPQ, McGill pain questionnaire; SCL, symptom checklist; SF-36, medical outcomes study short form-6; NRS, numerical rating scale; BPI, brief pain inventory; CES-D, center for epidemiologic studies-depression scale; SOPA, survey of pain attitudes.
virtual reality systems can be automated so that the treatment can be provided by a technician. Thus, it may be possible to use VR technology to make hypnotic analgesia more easily available to individuals who could benefit from this approach but who do not have access to a clinician trained in the use of hypnosis.

Research has identified a pattern of electroencephalographic (EEG) brain activity associated with hypnosis. Specifically, following hypnotic inductions, the amount of relative faster brain wave activity (e.g., beta waves) tends to decrease, and the amount of relative slower brain wave activity (e.g., alpha waves) tends to increase [5,29]. We already know that people can learn to alter brain wave activity through EEG-biofeedback [4,9]. It may therefore be possible to increase an individual’s ability to achieve a hypnotic or “hypnotic-like” state, and therefore respond more powerfully to hypnotic suggestions, if they are first given EEG-biofeedback training that teaches them to mimic the EEG patterns that have been associated with hypnosis [4].

Many patients who learn self-hypnosis strategies comment that they wished they had learned these strategies earlier, even before their pain problem became chronic. At the same time, there is evidence suggesting that chronic pain can have long-term detrimental effects on brain structures [2,26]. It is possible that the benefits of self-hypnosis training could be enhanced if it were provided very soon after an injury or the onset of pain; it is also possible that this treatment could buffer some of the negative long-term effects of pain on the CNS. One place where early intervention is now practiced is right on the battlefield, immediately after a battlefield injury [3]. Case study evidence also indicates that individuals with pain from war injuries can benefit from hypnosis [28]. As suggested to me by a colleague [11], perhaps it is time to consider, or at least study, the beneficial effects of early training in hypnotic strategies on pain and other symptoms in soldiers who have been injured or experienced trauma, especially given evidence that hypnosis can be used to improve post-traumatic stress disorder symptoms associated with trauma [12].

6. Summary and conclusions

A recent resurgence of interest in hypnosis and hypnotic analgesia may be fueled, at least in part, by a confluence of three recent trends: (1) the clear evidence that the experience of chronic pain is closely related to supraspinal nervous system activity; (2) research demonstrating that hypnosis has direct effects on the supraspinal sites that are linked to the experience of pain; and (3) research demonstrating that self-hypnosis training is effective for reducing the severity of chronic pain. However, hypnotic analgesia does not help everyone, nor does it always provide complete pain relief. While enough may now be known of its efficacy to recommend that hypnotic treatments be made more available to those individuals with chronic pain who are interested in this approach, research is also needed to help identify and develop methods for enhancing its efficacy, so that more individuals can obtain the significant benefits that hypnosis has to offer.

Conflict of interest

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