Pain Reduction Is Related to Hypnotizability but Not to Relaxation or to Reduction in Suffering: A Preliminary Investigation

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The present study examined the facilitation of pain reduction through the use of a pain reduction protocol. The protocol emphasized converting pain sensations into visual and auditory representations, which then were manipulated through therapeutic suggestion. Hypnosis was not mentioned in the intervention, minimizing creation of expectancy effects related to hypnosis. At the conclusion of the study, the Stanford Clinical Hypnotic Scale was administered. Measures of relaxation and reduction of suffering were not related to hypnotizability. However, pain reduction was significantly related to hypnotizability ($r = .55, P < .001$). High hypnotizables had a greater reduction in pain than low hypnotizables, even though both had equivalent degrees of relaxation.

Keywords: Hypnotizability, pain, relaxation, suffering

Introduction

Complementary and alternative nonpharmacological approaches to analgesia can be achieved effectively even when subjects are not told they are being hypnotized, and when the words “hypnosis” or “hypnotic” never are mentioned. (Katz, Kao, Spiegel & Katz, 1974; Miller, Barabasz & Barabasz, 1991; Freeman, Barabasz & Barabasz, 2000). Studies showing this phenomenon, to date, have used healthy subjects. The present paper explores this issue using a clinical population of chronic pain patients.
Hypnotizability and Pain

Hypnotically mediated psychological intervention for pain control and management has a long history and has been well-documented (Hawkins, 2001; Chaves & Dworkin, 1997; Barber, 1996; Holroyd, 1996; Crasilneck, 1995; Gracely, 1995; Chaves, 1994; Gainer, 1992; Patterson, 1992; Wain, 1992; Hart, 1991; Evans, 1990; Golan, 1987; Crasilneck & Hall, 1985; Hilgard & Hilgard, 1983; Spiegel & Spiegel, 2004). The precise mechanism underlying the effectiveness of hypnoanalgesia remains unknown, though multiple theories have been proposed.

Rainville et al. (1999) found that there were significant changes from baseline brain activity as measured by positron emission tomography, measures of regional cerebral blood flow, and electroencephalographic measures of brain electrical activity when individuals were hypnotized. They also found that there was a difference in brain activity as measured by these indicators between hypnotic relaxation alone and by hypnotic relaxation with suggestions for altering the experience of the pain.

De Pascalis, Magurano and Bellusci (1999) examined pain perception and correlations with hypnotizability as measured by somatosensory event-related potentials and skin conductance response. They found that while all subjects exhibited significant reductions of reported pain and distress ratings during the experimental conditions, the high hypnotizable subjects displayed significant reductions in pain and distress levels compared to mid and low hypnotizables. They also found that high hypnotizables, compared to mid and low hypnotizables, showed significant increases in both sensory and pain thresholds.

Freeman, Barabasz and Barabasz (2000) researched correlations of neocortical electrical activity in perception of pain between high and low hypnotizable subjects and found that high hypnotizables showed significantly increased relief of pain in the hypnotic condition compared to distraction or waking relaxation conditions. The high hypnotizables in the hypnotic condition also demonstrated significantly greater pain relief than the low hypnotizables.

Miller, Barabasz and Barabasz (1991), looking at differences between hypnotic inductions with and without relaxation, with or without specific suggestions for analgesia, found that high hypnotizables demonstrated lower pain scores than low hypnotizables. These authors also found that when specific suggestions for analgesia were given, the high hypnotizables achieved an additional and greater reduction in pain than the low hypnotizables; and that performance did not differ between inductions using relaxation or not. The authors concluded that relaxation was not necessary for hypnotic analgesia. Evidence to support that the sensory and the affective dimensions of pain were differentially responsive to suggestion was presented by Malone, Kurtz, and Strube (1989) when they investigated the effects of analgesia suggestion, relaxation suggestion, or no suggestion. Suggestions for hypnoanalgesia reduced subjects’ perceptions of the intensity of the pain without changing their perceptions of the unpleasantness of the painful stimuli. Suggestions for hypnotic-relaxation reduced the unpleasantness of the pain, but not the perceived intensity of the stimuli. In an extension of this work, Dahlgren, Kurtz, Strube and Malone (1995) again found that suggestions for hypnoanalgesia reduced experience of pain intensity significantly more than perceived unpleasantness of pain, and conversely, suggestions for hypnotic relaxation reduced the unpleasantness of the pain more than how intensely it was experienced.

Given that the above issues were never explored in clinical populations, the present study examined the relationship between hypnotizability, pain reduction, and emotional distress about the pain, using hypnotic-like interventions without mentioning the term “hypnosis.” Hypnosis was never mentioned in an attempt to minimize expectancy and subjects’ beliefs about hypnosis biasing the outcome of the pain reduction intervention.
Method

Prior to beginning the study, approval was sought and obtained from the Medstar Research Institute, Institutional Review Board to conduct a study with human subjects. This study was one of two studies conducted simultaneously using identical populations and clinical procedures. The first study focused on telemedicine issues and already has been published (Appel, Bleiberg, & Noiseux, 2001). The present study examined the relations between hypnotizability and pain reduction using a treatment intervention which was not labeled “hypnotic.”

Chronic pain subjects were recruited to study the efficacy of teaching self-regulation interventions via telehealth. Sixty subjects were screened by telephone and 27 who met criteria (described below) were included in the study. Subjects were given a stipend ($20.00) for their participation in the study, which consisted of 2 visits (screening visit and treatment session) and ranged from 4-5 hours of their time. Following telephone screening, patients were invited to attend a formal screening, which consisted of a brief clinical interview, completing the Beck Anxiety Scale (BAS; Beck, 1993), and the Personality Assessment Inventory (PAI; Morey, 1991). All participants were informed that the primary purpose of the study was to investigate the delivery of a pain intervention through telemedicine. They were told that the pain reduction technique that would be taught (described below) was one that was commonly used by the psychologists working with pain patients in the hospital’s clinics. Subjects were administered preintervention and postintervention measures and were administered the Stanford Clinical Hypnotic Scale (Morgan & Hilgard, 1975) at the very end of the study so as not to affect subjects’ expectation of learning the self-regulation techniques as being doing to “hypnosis.” The interventions consisted of a series of relaxation procedures to target the affective distress related to the pain and a guided imagery protocol for the sensory component of the pain.

Subjects

Twenty-seven subjects were recruited who met the study criteria: (1) experiencing pain longer than 6 months; (2) had no history of behavioral medicine interventions for pain management (this would ensure that they were naïve to the type of interventions to which they would be exposed); and (3) were not significantly depressed (as discerned through telephone screen and measurement by the PAI). There were 17 females and 10 males. They ranged in age from 22 to 72 with an average age of 50 and an average pain level at the time of the study of 4.85 on a 10-point scale. All of the patients had chronic pain with the average number of 12.9 years of being in pain. The majority of the subjects reported musculoskeletal pain. Fifteen subjects had lumbar pain, seven had pain of a rheumatological nature, three had cervical pain, one had peripheral neuropathy secondary to renal failure, and one had gynecological related pain.

Treatment Session

The treatment session consisted of two interventions directed at teaching self-regulation of the affective and sensory components of pain. The first intervention was a relaxation procedure. Relaxation training was accomplished using amodification of Gunther’s (1968) progressive sensory muscle relaxation exercise followed sequentially by internal repetition of five Autogenic (Schulte & Luthe, 1969) statements (each stated three times)
Hypnotizability & Pain

and a brief permissive guided imagery component of a pleasant environment imagined by
the subject (“safe place imagery”). The second intervention was an adaptation of Oyle’s
(1975) protocol. Oyle’s protocol (1975) is an imagery-based intervention in which the
patient is given suggestions to convert the kinesthetic qualities of the pain into an image
(visual or auditory based on preferred sensory modality). Subjects are then given a suggestion
to create a second image of health and healing. Lastly, they are given suggestion to observe
the interaction of both their images “in a way that is best for him or her.”

Measures

Multiple outcome measures were employed. At the beginning of the treatment
session, each subject was asked to complete Wolpe’s Subjective Unit of Discomfort Scale
(SUD; Kaplan, Smith & Coons, 1995) in response to the amount of distress that they were
feeling about the pain at that time (where 0 = no distress and 10 = the most distress that you
have ever experienced in life); the Relaxation Inventory (RI) which consists of 45 items
representing three orthogonally derived scales: physiological tension, physical assessment,
and cognitive tension. These scales demonstrate internal consistency with KR20 reliability
coefficients of .90, .95, and .81, respectively (Crist, Rickard, Prentice-Dunn, & Barker,
1989), and a 0-10 analog pain scale (Turk & Melzack, 1992) for the amount of pain they
experienced right then (where 0 = no pain and 10 = worst pain experienced). At the
conclusion of the interventions, these same scales were again completed. Following
completion of all of the above postmeasures, the Stanford Clinical Hypnotic Scale (SCHS;
Morgan & Hilgard, 1975) was utilized to measure degree of hypnotic responsiveness of the
subjects. The SCHS was administered at the conclusion of the session to reduce chances of
contaminating the experiment with the subjects’ preconceived expectations of hypnosis.

Data Analysis

Pre- and postintervention comparisons for RI subscales, SUDs, and pain were analyzed using both
t-tests with Bonferroni correction for multiple comparisons and also non-parametric Wilcoxon
two-sample tests. The results of both parametric and nonparametric analyses were essentially the
same. The relation of hypnotizability (SCHS), RI subscales, SUDs and pain scales were examined
by computing correlations between hypnotizability scores, and difference scores calculated by
subtracting presession scores from post-session scores for the aforementioned measures. Again,
parametric (Pearson) and nonparametric analyses (Spearman) yielded quite similar results, so the
parametric analyses are presented. For example, correlations of hypnotizability and pain in both
analyses revealed significance at the .01 level. While nonparametric analyses would have been
reasonable because much of the data were ordinal, an examination of the normality of the sample
distributions, all of which showed only mild skewness (range = 1.24 to -0.79) and acceptable
kurtosis (range = 1.50 to -1.05), allowed pursuit of parametric analyses. The parametric analyses
are presented below.

One subject refused to participate in testing for hypnotizability at the end of the study; 26
subjects were used in this analysis. In the analyses of the high hypnotizable subjects
compared to low hypnotizable subjects we used the convention that subjects scoring either, 0,1or 2
would be put in the low category, and subjects scoring 4 or 5 would be placed in the high category.
We eliminated all individuals with SCHS scores of 3, which reduced the sample-size to 24 subjects,
11 high and 12 low.
Appel and Bleiberg

**Efficacy of Intervention**

All outcome measures show significant main effects, demonstrating efficacy of the interventions. Preintervention measures of pain ranged from 1-9 with a mean of 4.85. Before the intervention there were 8 patients with low pain levels, 13 with moderate pain levels and 5 with severe pain levels. After the intervention, the distribution changed to 20 patients at low pain levels and 6 with moderate pain levels. The mean pain level after the intervention was 2.11 (SD 1.5) a treatment effect size was computed by subtracting mean pre-pain ratings from mean post-pain ratings and dividing by the pooled within standard deviation. The obtained effect size of 1.49 indicates that the pain intervention produced a decrease in pain levels of one half standard deviations.

Table 1 shows that there also was a significant decrease in subjective sense of distress about the pain (SUD), and a significant decrease in pain as well. Table 1 also shows that the intervention was highly effective for creating a relaxed physical and cognitive state in the subjects. The Relaxation Inventory sub-scales of Cognitive Tension and Physical Tension reveal increased relaxation as the numbers decrease and the Physical Assessment sub-scale reveals increased relaxation as the number increases.

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>Difference</th>
<th>t Stat</th>
<th>P((T≤t)) one-tail</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre SUD^1</td>
<td>4.33(2.54)</td>
<td>2.27</td>
<td>4.92</td>
<td>.000</td>
<td>1.05</td>
</tr>
<tr>
<td>Post SUD</td>
<td>2.05(1.77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre Pain ^2</td>
<td>4.85(2.17)</td>
<td>2.74</td>
<td>6.71</td>
<td>.000</td>
<td>1.49</td>
</tr>
<tr>
<td>Post Pain</td>
<td>2.11(1.50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre Phys Ass ^3</td>
<td>2.66(1.03)</td>
<td>-.92</td>
<td>-4.28</td>
<td>.000</td>
<td>.85</td>
</tr>
<tr>
<td>Post Phys Ass</td>
<td>3.58(1.10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre Cog Ten ^4</td>
<td>2.60 (.89)</td>
<td>.74</td>
<td>5.40</td>
<td>.000</td>
<td>.80</td>
</tr>
<tr>
<td>Post Cog Ten</td>
<td>1.86 (.92)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre Phys Ten ^5</td>
<td>2.19 (.80)</td>
<td>.51</td>
<td>3.99</td>
<td>.000</td>
<td>.69</td>
</tr>
<tr>
<td>Post Phys Ten</td>
<td>1.68 (.68)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

^1 SUD scale where 0 = no distress and 10 equals very distressed  
^2 Pain scale where 0 = no pain and 10 = worst pain ever experienced  
^3 Physical Assessment where 1 = strongly agree and 7 = strongly disagree  
^4 Cognitive Tension where 1 = strongly disagree and 7 = strongly agree  
^5 Physical Tension where 1 = strongly disagree and 7 = strongly agree

**Hypnotizability**

Table 2 shows that hypnotizability was not correlated with any of the three relaxation subscales, nor was hypnotizability correlated with change in SUD levels. However, changes in pain and SUD were correlated to each other (\(r = .61, p < .05\)). Table 2 also shows the overall correlation between hypnotizability and pain was .55, which was significant at the .01 level. Moreover, Table 3 shows this relation in more detail, with a breakdown of pain change scores between high and low hypnotizables. As also can be seen, the high and low hypnotizables were not different at the onset of the session, however, the high hypnotizables had a statistically significant pain reduction at a magnitude over twice as large as the low hypnotizables.
Table 2: Correlations between hypnotizability, relaxation, pain and distress

<table>
<thead>
<tr>
<th>Pearson Correlation</th>
<th>df = 24</th>
</tr>
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<tbody>
<tr>
<td>SCHS Diff</td>
<td>Phys Ten Diff</td>
</tr>
<tr>
<td>SCHS</td>
<td>1.00</td>
</tr>
<tr>
<td>Phys Ten Diff</td>
<td>-0.09</td>
</tr>
<tr>
<td>Phys Ass Diff</td>
<td>-0.03</td>
</tr>
<tr>
<td>Cog Ten Diff</td>
<td>0.10</td>
</tr>
<tr>
<td>Pain</td>
<td>0.55**</td>
</tr>
<tr>
<td>SUD</td>
<td>0.29</td>
</tr>
</tbody>
</table>

*p < .05*  
**p < .01**

Table 3: High vs. low hypnotizable subjects’ response to pain intervention

<table>
<thead>
<tr>
<th>SCHS</th>
<th>Pre-Pain Mean</th>
<th>Post-Pain Mean</th>
<th>Pre-Post Pain Difference</th>
<th>Wilcoxon P (one-tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>5.45 (2.53)</td>
<td>1.36 (1.36)</td>
<td>4.09 (2.54)</td>
<td>.008</td>
</tr>
<tr>
<td>Low</td>
<td>4.92 (1.78)</td>
<td>3.00 (1.46)</td>
<td>2.00 (1.26)</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The present findings indicate that the combination of interventions employed in the present study was successful in reducing subjects’ levels of pain and distress. The treatment resulted in significantly lower levels of pain for both groups. Even though the treatment was not labeled as being hypnotherapeutic or hypnotic, those subjects who were later found to be more highly hypnotizable showed greater levels of pain reduction. The results of this study are consistent with the conclusions of Hilgard and Hilgard (1983), who reported that the average correlation between hypnotizability and pain reduction was .50. However, what is more significant, is that the correlation of .55 in this study was found with actual pain patients as opposed to subjects experiencing experimental pain, and that hypnosis never was mentioned. It is noteworthy that the intervention was robust in terms of producing relaxation across most subjects. However, the magnitude of relaxation was not related either to pain reduction or to hypnotizability. While there was no correlation with hypnotizability and reduced discomfort, reduction in pain was correlated with reduction in discomfort, i.e. suffering.

In another type of design, the SCHS could be given randomly during the study, thus permitting a direct comparison of the effects of differences in subjects’ expectations. Also, to further understand the mechanisms underlying the experimental procedure, measurements of the expectations of subjects could be obtained (expectancy effect). What might have happened had we not mentioned that this treatment was used all the time at the hospital? Lastly, to investigate whether high hypnotizable subjects would have attained even greater reduction in pain and lower SUD levels, there could have been a condition where the intervention was labeled as hypnosis. Gandhi and Oakley (2005) found an effect
on suggestibility when a hypnotic induction was labeled as being hypnosis and when it was not. However, despite these considerations this study makes several significant contributions to the pain literature.

First, our findings of no significant relationship between hypnotizability and relaxation confirms the work of Miller et al. (1991), who compared relaxation, active alert hypnosis, and hypnotic analgesia. While the intervention produced relaxation, there was no observed relation between relaxation and pain reduction. However, pain reduction showed a statistically significant relation to hypnotizability. Thus, in the present study, relaxation and hypnotizability were independent.

Second, this finding is similar to that of De Pascalis et al. (1999). The average reduction of pain in the subject population as a whole was 2.8 points. Given a preintervention mean pain level of 4.85, this is a clinically meaningful decrease in pain. Both the high and low hypnotizable groups had essentially equal levels of pain at the outset 5.5 and 4.9 respectively. However, when looking at the difference between the high hypnotizable subjects and low hypnotizable subjects, it is clear the high hypnotizable subjects were significantly more able to reduce the intensity of pain than low hypnotizable subjects. The high hypnotizables achieved twice the level of pain reduction compared to the low hypnotizables.

Third, the present study also supports Malone et al. (1989), who found that suggestions for hypnotic analgesia reduced pain intensity, but not unpleasantness, and suggestions for hypnotic relaxation reduced unpleasantness but not pain intensity. The intervention used in the present study, based on Oyle’s (1975) protocol, involved targeting the sensory aspects of the pain alone, and within that protocol there were no specific suggestions given for experiencing pleasantness or emotional relief. Finally, our findings are also consistent with Freeman, et al. (2000) who found that high hypnotizables demonstrated significantly greater pain relief than low hypnotizables in response to hypnosis.

References

Hypnotizability & Pain


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