Hypnosis for Chronic Pain Management: Efficacy and Mechanisms

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Overview

- Chronic pain is a significant problem
- Hypnosis is effective by itself
- Hypnosis enhances the efficacy of other (pain) treatments
- Discuss possible mechanisms
The problem of chronic pain

Chronic pain of all types

15% - 20% (Blyth et al., 2001; Sjogren et al. 2008; Verhaak et al., 1998)
The problem of chronic pain

Chronic widespread pain

5% - 7% (Gerdle et al., 2008)
The problem of chronic pain

Neuropathic pain

3% - 8% (Gustorff et al., 2008)
The problem of chronic pain
The problem of chronic pain
The problem of chronic pain

Average pain reduction for opioids?
The problem of chronic pain

Average pain reduction for opioids? 32%

~ Turk, 2002
The problem of chronic pain

Median response rate for neuropathic pain?
The problem of chronic pain

Median response rate for neuropathic pain? 35%

~ McQuay et al., 1996
The problem of chronic pain

There is a need to develop new effective pain interventions
Maybe hypnosis?
Themes/hypotheses underlying program

Peripheral activity may trigger pain,
Themes/hypotheses underlying program

➔ Peripheral activity may trigger pain, but it is the brain that creates the experience of pain.
Themes/hypotheses underlying program
Hypnotic pain

Derbyshire et al., 2004

- Can one use hypnosis to induce pain?
- Does “hypnotic pain” differ from “imagined pain” and “real” pain?
- Intensity and cortical activity in response to painful heat, hypnotic pain, & “imagined pain”.

Hypnotic pain

Effect on pain experience:
- Stimulation: 5.7/10 (3-10)
- Hypnotic pain: 2.8/10 (1-9)
- Imagined pain: 0/10 (0)
- Response to stimulation and hypnosis was variable
Hypnotic pain

The evidence indicates that...

- Brain is final common pathway to experience
- Hypnosis can enhance ability to alter experience
Clinical trial

RCT of Self-Hypnosis Training versus EMG-biofeedback for SCI-related chronic pain

Funded by NIH, NICHD, NCMRR

Questions:
- What percent of patients benefit?
- Do benefits last beyond the sessions?
- Is self-hypnosis training more effective than a viable alternative treatment?
Procedures

N = 37 patients with SCI and chronic pain assigned to hypnosis (HYP) or EMG-assisted relaxation (BIO).

10 sessions of treatment

Outcome assessed before and after treatment, and at 3-month follow-up
Study participants

Mean age = 49.5 yrs (Range, 19 – 70)
76% males, 24% females
95% Caucasian, 5% Native American
45% Neuropathic pain; 55%
Nonneuropathic pain
28 (76%) completed treatment (5 HYP and
4 BIO dropouts)
Primary outcome measure

Usual pain intensity
- Rating of average (past 24 hours) intensity on 0-10 scale four times in 7 days.
- At pre-baseline, post-baseline, post-treatment, and 3-month follow-up.
- 4 ratings averaged into single score, range from 0-10.
- Assessed by phone by blind RA.
Secondary outcome measures

Current pain intensity before and after session: 0 – 10 Numerical Rating Scale (NRS).

Frequency and effects of practice (for those in HYP): Number of days of practice and relief on a 0-10 NRS.
Self-Hypnosis training intervention

**Induction:** variant of Barber’s Rapid Induction Analgesia.

“**Special Place**” imagery: A safe and comfortable place.

**Decreased unpleasantness:** “You can experience being less and less bothered by any sensations…”

**Diminished pain:** “Any sensations are becoming less and less clear, getting smaller and smaller…”

**Imagined anesthesia:** “Picture any areas of discomfort being engulfed and infused with a powerful psychological anesthesia…”
Self-Hypnosis training intervention

**Sensory substitution**: “Notice feelings like numbness or warmth in areas that used to be uncomfortable…”

**Deep relaxation**: “Imagine your right hand becoming more and more relaxed, heavier and heavier…”

**Post-hypnotic suggestions**: Self-hypnosis: “Any time you’d like to feel more comfortable, take a deep, satisfying breath…” Extension of effects: “Benefit will stay with you…become a part of who you are…”

**Practice**: Given practice tape, and encouraged to practice at least daily.
EMG-Assisted Biofeedback

Frontalis EMG-biofeedback to reduce frontalis activity.

Patients given a relaxation audio recording

Both treatments described as “Interventions that contain both relaxation and hypnosis components that have been shown to reduce pain in other populations”
Results: Pre- to post-session pain

The graph shows the comparison of pre-session and post-session pain levels for two groups: HYP and BIO. The HYP group shows a significant decrease in pain levels from pre-session to post-session, whereas the BIO group has a smaller decrease. The pain levels are measured on a scale from 0 to 5.
Results: Usual pain intensity

Responders: 22% HYP; 10% BIO
Results: Practice frequency and effects

Of the HYP participants @ 3 -mo:
60% still listened to the audio recording (Range, 2-25 days)
80% used skills w/o recording (range, 2-30 days)
Average relief w/ recording: 3.58; w/o: 3.44
Average hours of relief w/ recording: 3.07; w/o: 1.42
Conclusions
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Both HYP and BIO have a similar immediate (substantial) effect on pain intensity.
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HYP more effective than BIO for daily average pain.
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Decreases in usual daily pain with HYP maintain for at least 3 months.
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Treatment outcome is variable: Not all benefit.
Conclusions

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HYP more effective than BIO for daily average pain.
Decreases in usual daily pain with HYP maintain for at least 3 months.
Treatment outcome is variable: Not all benefit.
But, 80% continue to use skills taught at 3 months, and report pain relief that lasts 1.5 – 3.5 hours.
Conclusions

Both HYP and BIO have a similar immediate (substantial) effect on pain intensity. HYP is more effective than BIO for daily average pain. Decreases in usual daily pain with HYP maintain for at least 3 months. Treatment outcome is variable: Not all benefit. 80% continue to use skills taught at 3 months, and report pain relief that lasts 1.5 – 3.5 hours.
MS trial (HYP vs. PMR; N = 22)

Responders: 47% HYP; 14% PMR
“Side effects” of hypnotic analgesia

Asked 30 patients who had received the HYP protocol about the “other effects” of treatment:
“Side effects” of hypnotic analgesia

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- 40 effects listed
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- 23 (58%) nonpain-related benefits
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Asked 30 patients who had received the HYP protocol about the “other effects” of treatment:
- 40 effects listed
- 9 (23%) pain-related benefits
- 23 (58%) nonpain-related benefits
- 5 (13%) ‘neutral’ effects
“Side effects” of hypnotic analgesia

Asked 30 patients who had received the HYP protocol about the “other effects” of treatment:
- 40 effects listed
- 9 (23%) pain-related benefits
- 23 (58%) nonpain-related benefits
- 5 (13%) ‘neutral’ effects
- 3 (8%) ‘negative’ effects
Pain-related benefits

Pain reduction (40%)
Increased control over pain (40%)
“I have a new tool for managing pain” (30%)
Nonpain-related benefits

General positive comments (e.g., “It helped”, “I liked it”): 37%

Increased well-being: 33%

Increased relaxation: 23%

Decreased stress: 17%
Negative effects

“It did not work” (3%)
“Not as effective as I hoped it would be” (3%)
“Effects did not last as long as I hoped” (3%)
Imagine a Drug That...
Imagine a Drug That...

Produces a substantial ↓ in pain in 22% (SCI) to 47% (MS) of patients w/ chronic refractory pain
Imagine a Drug That…

Produces a substantial ↓ in pain in 22% (SCI) to 47% (MS) of patients w/ chronic refractory pain whose “side effects” are mostly positive, and include ↑’d sense of well-being and relaxation.
Imagine a Drug That...

Produces a substantial ↓ in pain in 22% (SCI) to 47% (MS) of patients w/ chronic refractory pain

Whose “side effects” are mostly positive, and include ↑’d sense of well-being and relaxation

Whose worst side effects are: has no effect (3%), not as effective as hoped (3%), or benefits do not last as long as hoped (3%)
Imagine a Drug That...

- Produces a substantial ↓ in pain in 22% (SCI) to 47% (MS) of patients w/ chronic refractory pain
- Whose “side effects” are mostly positive, and include ↑’d sense of well-being and relaxation
- Whose worst side effects are: has no effect (3%), not as effective as hoped (3%), or benefits do not last as long as hoped (3%)
- That continues to be effective (no tolerance) and that most patients (80%) continue to use...
Reviews of Randomized Trials
Reviews of Randomized Trials

Findings consistent; reviews have the **conclusions** (Elkins et al., 2007; Montgomery et al., 2000; Jensen & Patterson, 2005; Patterson & Jensen, 2003)
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Hypnotic analgesia more effective than no treatment and some biomedical treatments (PT, medications)
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Hypnotic analgesia has specific effects over and above placebo (expectancy) effects
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Hypnotic analgesia has specific effects over and above placebo (expectancy) effects

Response to hypnotic treatment is variable
Reviews of Randomized Trials

Findings consistent; reviews have the conclusions (Elkins et al., 2007; Montgomery et al., 2000; Jensen & Patterson, 2005; Patterson & Jensen, 2003)

Hypnotic analgesia more effective than no treatment and some biomedical treatments (PT, medications)

Hypnotic analgesia has specific effects over and above placebo (expectancy) effects

Response to hypnotic treatment is variable
Adding hypnosis to other treatments may also enhance their efficacy.
Hypnosis as an Adjunct to Cognitive–Behavioral Psychotherapy: A Meta-Analysis

Irving Kirsch, Guy Montgomery, and Guy Sapirstein
University of Connecticut
Hypnosis may enhance CBT

- Meta-analysis of 18 studies comparing CBT with CBT+HYP
Hypnosis may enhance CBT

- Meta-analysis of 18 studies comparing CBT with CBT+HYP

- Hypnosis substantially enhanced outcome (average ES = 1.36)
Hypnosis may enhance CBT

- Meta-analysis of 18 studies comparing CBT with CBT+HYP
- Hypnosis substantially enhanced outcome (average ES = 1.36)
- Effects strongest for treatments of obesity and for long-term f/u
Hypnosis may enhance CBT

Weight loss as a function of hypnosis condition

Source: Kirsch et al., 1995
EFFECTS OF SELF-HYPNOSIS TRAINING AND COGNITIVE RESTRUCTURING ON DAILY PAIN INTENSITY AND CATASTROPHIZING IN INDIVIDUALS WITH MULTIPLE SCLEROSIS AND CHRONIC PAIN

MARK P. JENSEN, DAWN M. EHDE, KEVIN J. GERTZ, BRENDA L. STOELB, TIARA M. DILLWORTH, ADAM T. HIRSH, IVAN R. MOLTON, AND GEORGE H. KRAFT

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Hypnosis may enhance CBT

- Pilot study
- 4 sessions of ED, CT, HYP, HYP-CT
- N = 16 MS and chronic pain
- Measured intensity (0-10), interference (BPI), and catastrophizing (PCI) before and after each module
Hypnosis may enhance CBT

Average Pain Intensity

![Graph showing the effect of different conditions on average pain intensity. The x-axis represents time (Pre, Assessment Point, Post), the y-axis represents effect size. The graph illustrates a decrease in pain intensity from Pre to Post for all conditions, with Hypnosis showing the most significant decrease.](image-url)
Hypnosis may enhance CBT

Average Pain Intensity

![Graph showing average pain intensity over pre, assessment point, and post conditions. The graph indicates a decrease in pain intensity over time, with the hypnosis condition showing the greatest reduction.](graph.png)
Hypnosis may enhance CBT

Average Pain Intensity

Graph showing the change in average pain intensity over time with different conditions: Cog Ther, Ed, Hyp CT, and Hypnosis. The graph indicates that Hypnosis shows a greater effect size and a decrease in pain intensity from Pre to Post compared to the other conditions.
Hypnosis may enhance CBT

Average Pain Intensity
Hypnosis may enhance CBT
Hypnosis may enhance CBT

Pain Interference

-0.03
Hypnosis may enhance CBT

Pain Interference

Effect Size vs. Assessment Point

Pre  | Post

Cog Ther | Ed | Hyp CT | Hypnosis

-.03  | .11
Hypnosis may enhance CBT

Pain Interference

![Graph showing the effect of hypnosis on pain interference]

- Pre: .11
- Post: .16
- Hypnotherapy: .03
Hypnosis may enhance CBT

Pain Interference
Hypnosis may enhance CBT

Catastrophizing

-19
Hypnosis may enhance CBT

Catastrophizing

![Graph showing mean effect size over pre and post assessment points with data points at 0.19 and 0.27 for Hypnosis condition.]
Hypnosis may enhance CBT

Catastrophizing

![Graph showing pre and post scores for different conditions]

- Pre: Catastrophizing scores
- Post: Catastrophizing scores for different groups (Cog Ther, Ed, Hyp CT, Hypnosis)

- Cog Ther: .19
- Ed: .27
- Hyp CT: .45

Hypnosis may enhance CBT
Hypnosis may enhance CBT

- Ongoing 4-arm RCT
Hypnosis may enhance CBT

- Ongoing 4-arm RCT
- SCI (43), MS (15), MD (3), AMP (1)
Hypnosis may enhance CBT

- Ongoing 4-arm RCT
- SCI (43), MS (15), MD (3), AMP (1)
- 4 sessions: ED, CT, HYP, HYP-CT
Hypnosis may enhance CBT

- Ongoing 4-arm RCT
- SCI (43), MS (15), MD (3), AMP (1)
- 4 sessions: ED, CT, HYP, HYP-CT
- Measure intensity (0-10), depression (PHQ-9), and interference (BPI), before and after treatment
Hypnosis may enhance CBT

- Ongoing 4-arm RCT
- SCI (43), MS (15), MD (3), AMP (1)
- 4 sessions: ED, CT, HYP, HYP-CT
- Measure intensity (0-10), depression (PHQ-9), and interference (BPI), before and after treatment
- RA blind to treatment condition
Hypnosis may enhance CBT

Average Pain Intensity (0-10 NRS)
Hypnosis may enhance CBT

Average Pain Intensity (0-10 NRS)
Hypnosis may enhance CBT

Average Pain Intensity (0-10 NRS)
Hypnosis may enhance CBT

Average Pain Intensity (0-10 NRS)
Hypnosis may enhance CBT

Average Pain Intensity (0-10 NRS)

Effect sizes:
- ED, $d = .73$
- CT, $d = .60$
- HYP, $d = .54$
- H-CT, $d = 1.00$

* $< .05$
† $= .066$
Hypnosis may enhance CBT

Average Pain interference (BPI)
Hypnosis may enhance CBT

Average Pain interference (BPI)
Hypnosis may enhance CBT

Average Pain interference (BPI)
Hypnosis may enhance CBT

Average Pain interference (BPI)
Hypnosis may enhance CBT

Average Pain interference (BPI)

Effect sizes:
ED, $d = .50$
CT, $d = .60$
HYP, $d = .71$
H-CT, $d = 1.51$

* < .05
Pilot study: Hypnosis focusing on pain reduction $>$ ED & CT
Clinical trial: Hypnosis focusing on pain reduction $=$ ED & CT
Why different results?

Effect size for ED differed

→ Pilot $d = 0.04$; trial $d = 0.73$
Why different results?

Effect size for ED differed
→ Pilot $d = .04$; trial $d = .73$

Effect size for HYP the same
→ Pilot $d = .56$; trial $d = .54$
Why different results?

Effect size for ED differed
→ Pilot $d = .04$; trial $d = .73$

Effect size for HYP the same
→ Pilot $d = .56$; trial $d = .54$

Effect size for HYP-CT the same
→ Pilot $d = .97$; trial $d = 1.00$
What was consistent?
Hypnotic cognitive therapy doubles the efficacy...
What was consistent?

Hypnotic cognitive therapy doubles the efficacy (over CT or hypnosis focusing only on pain reduction)
What was consistent?

Hypnotic cognitive therapy *doubles the efficacy* (over CT or hypnosis focusing only on pain reduction).
HYP-CT > HYP and CT

Why?
What’s wrong with CT alone?
What’s wrong with CT alone?

It does not take advantage of the increase in cognitive flexibility produced by hypnosis.
What’s wrong w/ HYP → Pain reduction?
What’s wrong w/ HYP → Pain reduction?

It focuses on....
What’s wrong with pain-focused HYP?

It focuses on... pain
What’s wrong with pain-focused HYP?

It focuses on....pain
What’s wrong with pain-focused HYP?

It focuses on....pain
What’s wrong with pain-focused HYP?

It focuses on....pain

Image courtesy of FreeDigitalPhotos.net
What’s wrong with pain-focused HYP?

It focuses on... pain

Image courtesy of FreeDigitalPhotos.net
What’s right with HYP-CT?

It focuses on....
What’s right with HYP-CT?

It focuses on....Life

Images courtesy of FreeDigitalPhotos.net
What’s right with HYP-CT?

It focuses on....Life

Images courtesy of FreeDigitalPhotos.net
What’s right with HYP-CT?

It focuses on....Life

Images courtesy of FreeDigitalPhotos.net
What’s right with HYP-CT?

It focuses on....Life
What’s right with HYP-CT?

It focuses on....Life
How does hypnosis work?
How does hypnosis work?

Imagery research on *location* of effects

EEG research on *mechanisms* of effects

Painful heat stimulation in alert and hypnosis conditions resulted in CBF increases in:
- Sensory cortex 1 [S1] and 2 [S2]; and
- Anterior cingulate gyrus [ACC]).

Hypnotic suggestions for increased or decreased unpleasantness altered
- Perception of pain affect (81/100 → 45/100); and
- activation in ACC only
Imagery evidence

¬ No difference in activity in sensory cortex
Imagery evidence

→ Large difference in activity in ACC
The ACC responds to suggestions for changes in pain unpleasantness.
Hypnotic suggestions for increased or decreased pain intensity altered perception of pain intensity (70/100 \( \rightarrow \) 33/100) and activation in sensory cortex but not ACC.

~ Hofbauer et al., 2001
Imagery evidence

Hypnosis targets specific brain areas and processes
### Mechanisms of effects

<table>
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<th>Frequency Band Name</th>
<th>Frequency Bandwidth</th>
<th>State(s)</th>
<th>Example</th>
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<td>Raw EEG</td>
<td>0-45 Hz</td>
<td>Awake</td>
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<tr>
<td>Delta</td>
<td>0.5-3.5 Hz</td>
<td>Deep sleep</td>
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<tr>
<td>Theta</td>
<td>4-7.5 Hz</td>
<td>Drowsy/Focused</td>
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<td>Alpha</td>
<td>8-12 Hz</td>
<td>Relaxed</td>
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<td>13-30/&gt;30 Hz</td>
<td>“Thinking”</td>
<td><img src="image" alt="Beta/gamma Example" /></td>
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Theta and hypnosis

- More baseline theta → ↑ Hypnotic responding

Theta and hypnosis

- More baseline theta $\rightarrow$ ↑ Hypnotic responding
- Hypnotic procedures ↑ theta

Theta and hypnosis

- More baseline theta $\rightarrow$ ↑ Hypnotic responding

- Hypnotic procedures ↑ theta

$\rightarrow$ **Working hypothesis**: Theta activity facilitates hypnotic responding.
What does theta do?

Plays a key role in all learning and memory tasks

What does theta do?

Plays a key role in all learning and memory tasks

When theta is present:
- Easier to recall and recreate experience
- The record button is “on”

Predicting $\Delta$ pain from baseline EEG
Predicting $\Delta$ pain from baseline EEG
Predicting Δ pain from baseline EEG

- Hyp

**δ**
- Moderate (.30+) positive association; more of this = more response

**τ**
- Moderate (-.30) negative association; less of this = more response

**α**

**β**

**γ**
- Statistically significant (p < .05)
Predicting $\Delta$ pain from baseline EEG

Hyp  Sham tDCS

$\delta$
$\tau$
$\alpha$
$\beta$
$\gamma$
Predicting Δ pain from baseline EEG

- Hyp
- δ = Moderate (.30+) positive association; more of this = more response
- τ = Moderate (-.30) negative association; less of this = more response
- α = Statistically significant (p < .05)
Predicting Δ pain from baseline EEG

Hyp = Moderate (.30+) positive association; more of this = more response

δ = Moderate (-.30) negative association; less of this = more response

α = Statistically significant (p < .05)
Predicting $\Delta$ pain from baseline EEG

Unique to hypnosis?
Predicting $\Delta$ pain from baseline EEG

<table>
<thead>
<tr>
<th>Hyp</th>
<th>Med</th>
<th>NF</th>
<th>tDCS</th>
<th>Sham tDCS</th>
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Summary

Chronic pain is a significant problem
Summary

Chronic pain is a significant problem

Hypnosis can:

Reduce pain intensity and negative impact
Summary

Chronic pain is a significant problem.

Hypnosis can:
- Reduce pain intensity and negative impact
- Enhance the efficacy of other pain treatments
Summary (cont’d)

Effects strong – double the effect
Summary (cont’d)

Effects strong – double the effect
Focusing on enhanced life quality
more effective than focusing
(only) on symptom reduction
Hypnosis may ↑ efficacy via its effects on brain states (theta)…
Summary (cont’d)

Hypnosis may ↑ efficacy via its effects on brain states (theta)…

Which provides easier access to the “recall” and “record” functions
Hypnosis may ↑ efficacy via its effects on brain states (theta)…
Which provides easier access to the “recall” and “record” functions
→ We are in the process of testing these ideas more thoroughly
Acknowledgements

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