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# HYPNOSIS TO MANAGE DISTRESS RELATED TO MEDICAL PROCEDURES: A META-ANALYSIS

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## Abstract

This meta-analysis evaluates the effect of hypnosis in reducing emotional distress associated with medical procedures. PsycINFO and PubMed were searched from their inception through February 2008. Randomized controlled trials of hypnosis interventions, administered in the context of clinical medical procedures, with a distress outcome, were included in the meta-analysis (26 of 61 papers initially reviewed). Information on sample size, study methodology, participant age and outcomes were abstracted independently by 2 authors using a standardized form. Disagreements were resolved by consensus. Effects from the 26 trials were based on 2342 participants. Results indicated an overall large effect size (ES) of 0.88 (95% *CI* = 0.57–1.19) in favour of hypnosis. Effect sizes differed significantly ($p < 0.01$) according to age (children benefitted to a greater extent than adults) and method of hypnosis delivery, but did not differ based on the control condition used (standard care vs. attention control). Copyright © 2008 British Society of Experimental & Clinical Hypnosis. Published by John Wiley & Sons, Ltd.

**Key words:** hypnosis, emotional distress, medical, meta-analysis

## Introduction

> *I learned a long time ago that minor surgery is when they do the operation on someone else, not you. Bill Walton* (Elston, 2005: 14)

As the above quotation reveals, medical procedures are often associated with a great deal of emotional distress for patients, and the possible sources of such distress are manifold. The procedures themselves can involve 'immobilization, darkness (in the case of image-guided procedures), masked strangers, fear for life and health, uncertainty of outcome, and abdication of control' (Flory, Salazar and Lang, 2007: 304). For those procedures involving anesthesia, patients may possess additional concerns. Research indicates that up to 54.5% of patients fear being unable to 'wake up' after surgery, and up to 54% fear 'waking up' during surgery (Klafta and Roizen, 1996). Furthermore, 16% fear pain associated with procedures, and on a more general level, up to 62% fear anesthesia (Klafta and Roizen, 1996). Depending on the procedure, there can also be tremendous concerns about post-procedure functioning, including concerns about subsequent pain, impaired daily living, body image (e.g. scarring; Ersek and Denton, 1986; Chun and Velanovich, 2002), and diagnosis/prognosis (i.e. what the surgeon will find (Schnur, Montgomery, Hallquist, Goldfarb, Silverstein and Weltz, 2008b)).

Emotional distress related to medical procedures not only causes direct suffering, but across procedures, pre-procedure emotional stress and distress have been related to a

 
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variety of adverse post-procedure outcomes including: postoperative emotional distress (Munafo and Stevenson, 2001); pain (e.g. (Kain, Servarino, Aleander, Pincus and Mayes, 2000; Cohen, Fouladi and Katz, 2005; Carr, Brockbank, Allen and Strike, 2006; Hong, Jee and Luthardt, 2005; Munafo and Stephenson, 2001)); postsurgery nausea and fatigue (Montgomery and Bovbjerg, 2004); failure to return to work and failure to report improvements in pain and functional ability (Trief, Grant and Fredrickson, 2000); recovery room and total analgesic requirements (Pan, Coghill, Houle, Seid, Lindel and Parker, 2006); dose/demand ratio for patient controlled analgesia (PCA), degree of dissatisfaction with PCA (Ozalp, Sarioglu, Tuncel, Aslan and Kadiogullari, 2003); increased propofol requirements (Osborn and Sandler, 2004; Hong et al., 2005); and worsened wound healing (Ginandes, Brooks, Sando, Jones and Aker, 2003).

Therefore, to reduce both the direct negative experience of emotional distress related to medical procedures, as well as the possible negative downstream consequences of such distress, interventions which significantly reduce distress are needed to improve patient experience. Although pharmacologic interventions can be beneficial, they are not without cost. They can cause their own side effects (Klein, 1991; Hollenhorst, Munte, Friedrich, Heine, Leuwer and Becker, 2001; Flory et al., 2007), and they can be a drain on medical staff time because patients taking sedatives can require increased monitoring and nursing care (Murphy and Brunberg, 1997). An additional issue is that it can be difficult to precisely time when to administer anxiolytic medication; if given too late, such medication may not become effective until after the procedure has already begun (Quirk, Letendre, Ciottone and Lingley, 1989; Murphy and Brunberg, 1997). All of these factors suggest that a non-pharmacologic adjuvant treatment for patient emotional distress would be an important tool for patient care.

Hypnosis is a non-pharmacologic intervention, with no known specific side effects (Rhue, Lynn and Kirsch, 1993; Lynn, Martin and Frauman, 1996), which has been shown in both narrative reviews (Redd, Montgomery and DuHamel, 2001; Flory et al., 2007) and meta-analysis (Montgomery, David, Winkel, Silverstein and Bovbjerg, 2002) to be beneficial in reducing distress related to medical procedures. However, the existing reviews in this area have been limited in several ways. The Redd et al. paper (2001) served to illustrate the effectiveness of hypnosis in the context of medical procedures, but was focused exclusively on the cancer setting, and thus did not include the broader gamut of medical procedures. The paper by Flory and colleagues was a narrative review of a select number of trials, which provided an illustration of the effectiveness of hypnosis for medical procedures, rather than providing a comprehensive review of the literature. Furthermore, neither the Redd et al. nor the Flory et al. papers provided an empirical summary of the data reviewed. The meta-analysis (Montgomery et al., 2002) did provide such empirical data, but was limited in that it focused exclusively on the surgical setting, and neglected individuals undergoing other types of medical procedures (e.g. lumbar puncture, radiotherapy). In addition, the meta-analysis did not limit its inclusion criteria to randomized controlled trials, which are considered the 'gold standard' research design.

Therefore the current literature is lacking a meta-analysis of randomized controlled trials on the use of hypnosis to reduce emotional distress related to a broad range of medical procedures, both surgical and non-surgical. The primary goal of the present study was to remedy this gap in the literature by using meta-analytic techniques with data from published randomized controlled trials to estimate the effectiveness of hypnosis in managing distress related to medical procedures.


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## Method

### *Search strategy*

Two electronic databases, PsycInfo and PubMed were searched from their respective inceptions through the end of February 2008.

For PsycInfo, the major search terms were (mj = hypnosis OR mj = hypnotherapy) AND (mj = distress or mj = medical treatment general or mj = treatment effectiveness evaluation or mj = postsurgical complications or mj = anxiety or mj = stress-management or mj = stress or mj = treatment outcomes or mj = fear or mj = emotional states or mj = relaxation), and the limitations placed on the search were ((DT:PSYI = CHAPTER) or (DT:PSYI = JOURNAL-ARTICLE)) and (LA:PSYI = ENGLISH) and ((MD:PSYI = EMPIRICAL-STUDY) or (MD:PSYI = FIELD-STUDY) or (MD:PSYI = FOLLOWUP-STUDY) or (MD:PSYI = LONGITUDINAL-STUDY) or (MD:PSYI = META-ANALYSIS) or (MD:PSYI = PROSPECTIVE-STUDY) or (MD:PSYI = QUANTITATIVE -STUDY) or (MD:PSYI = RETROSPECTIVE-STUDY) or (MD:PSYI = TREATMENT-OUTCOME-CLINICAL-TRIAL)) and ((PT:PSYI = JOURNAL) or (PT:PSYI = PEER-REVIEWED-JOURNAL) or (PT:PSYI = PEER-REVIEWED-STATUS-UNKNOWN)). This yielded a total of 248 abstracts/titles.

For PubMed, the search terms were: ('Hypnosis'[Mesh] OR 'Hypnosis, Dental' [Mesh])AND('Stress Disorders, Traumatic'[Mesh] OR 'Postoperative Complications' [Mesh] OR 'Treatment Outcome'[Mesh] OR 'Stress, Psychological'[Mesh] OR 'Preoperative Care'[Mesh] OR 'Anxiety'[Mesh] OR 'Depression'[Mesh] OR 'Fear'[Mesh] OR 'Affect'[Mesh] OR 'Relaxation'[Mesh] OR 'Emotions'[Mesh] OR 'Psychology'[Mesh]). The only limitation placed on the search was that the articles had to be written in English. This yielded a total of 1661 abstracts/titles.

### *Selection strategy*

The abstracts/titles of all articles identified by electronic searches (1909 in total) were carefully screened by three of the authors in the study to determine if the abstracts met the following inclusion criteria: (a) published in a peer reviewed journal; (b) full abstract available online; (c) randomized trial; (d) written in English; (e) included at least one control condition; (f) hypnosis was listed as at least one of the intervention conditions; (g) the use of hypnosis was specifically related to a medical or dental procedure (other than childbirth, which was considered to be a phenomenon rather than a procedure); (h) some measure of distress (e.g. anxiety) or emotional well-being (e.g. relaxation) was identified as an outcome variable; (i) the study was not a secondary analysis of an existing data set; (j) the study had sufficient data to calculate an effect size; and (k) the study was not a duplicate (i.e. if an article was cited in both PubMed and PsycInfo, it was only used once).

Subsequent to abstract review, 61 manuscripts were obtained and read in full, independently by two co-authors, each of whom completed a standardized form assessing the inclusion criteria. All four co-authors then met to review these 61 manuscripts. Based on consensus review by all authors, 26 of those 61 papers were included in the meta-analysis. It is interesting to note that although the electronic search was for hypnosis interventions, six papers were retrieved which referred to their interventions as suggestion rather than hypnosis. These papers were included as they met all remaining inclusion criteria, and would provide an interesting comparison to interventions labelled hypnosis. The reasons for exclusion were as follows: in 14 studies, participants were not randomly assigned to study group, 5 studies did not have sufficient data to calculate an effect size,

 
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3 studies were secondary data analyses, 3 studies were not RCTs (i.e. they were review papers), 3 studies did not concern a specific medical procedure, 3 did not have a control condition, in 2 distress was not an outcome, and in one the intervention was not referred to as hypnosis or suggestion. Additionally, one paper was excluded (Lee, 2003) as the intervention was multimodal (hypnosis in addition to cognitive behavioural counselling), rather than being hypnosis focused (see QUORUM Flow Chart, Figure 1).

### *Data abstraction and study characteristics*

For each of the 26 papers accepted for inclusion into the meta-analysis, relevant data was abstracted using a standardized worksheet. Each paper was abstracted independently by two of the co-authors. Any discrepancies were discussed among the authors with reference to the original manuscript until consensus was reached. Specific data collected included:

(1) between-group results on distress outcomes needed to calculate an effect size (e.g. means, standard deviation, sample sizes, test statistics);
(2) how the hypnosis intervention was labelled by the authors, coded as either 'hypnosis' or 'suggestion.' 'Hypnosis' was defined as the actual word hypnosis, as well as its derivatives (e.g. hypnotherapeutic ego strengthening). 'Suggestion' was defined as any derivative of the term suggestion (e.g. therapeutic suggestions). It should be noted that although our original intent was to restrict the sample to studies which explicitly labelled their intervention 'hypnosis,' we realized upon reviewing the literature retrieved that there were a small but substantial number of studies which called their intervention 'suggestions'. The methodological descriptions of these 'suggestion' interventions were remarkably similar to those for 'hypnosis' interven-

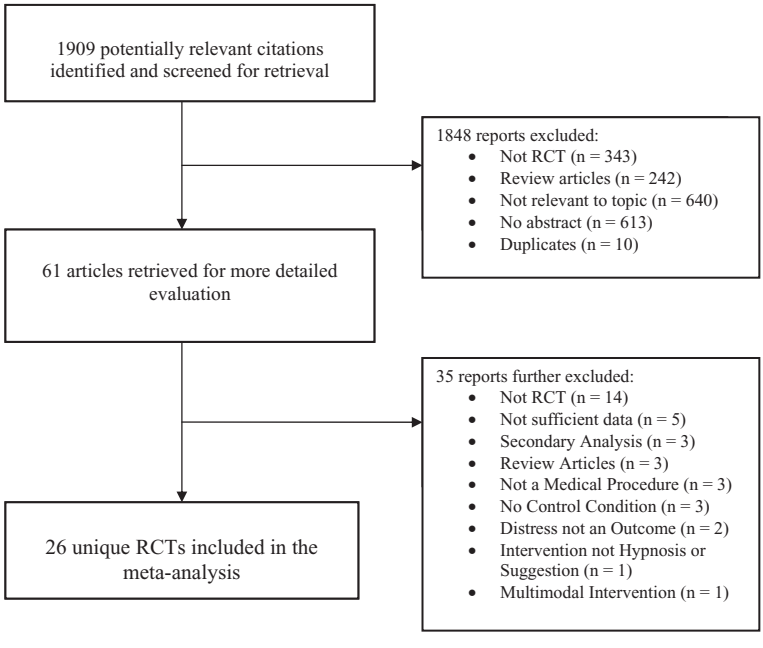


**Figure 1.** QUORUM flow chart.


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tions, with the exception that the authors did not label 'suggestion' interventions as 'hypnosis'. We therefore decided to code this data, in the service of conducting an exploratory moderation analysis of whether the intervention label was associated with intervention effect size;

(3) average participant age, which was examined categorically. Child was defined as less than or equal to age 18;
(4) control condition, which was coded as either 'standard care' or as 'attention control.' 'Attention control' was defined as any control condition other than standard care (e.g. blank tape, white noise);
(5) method of hypnosis delivery, which was coded as either 'live' or 'recorded.' 'Live' was defined as an intervention with any live, in-person component. 'Recorded' was defined as an intervention with *no* live, in-person component;
(6) timing of intervention delivery, which was coded as either 'pre,' 'during,' or 'pre and during.' 'Pre' was defined as an intervention delivered prior to a medical procedure, 'during' was defined as an intervention delivered during the medical procedure with *no* pre-procedure delivery, and interventions which incorporated both delivery approaches were labelled 'pre and during';
(7) whether or not the effect size needed to be imputed. This was coded as 'Imputed,' which indicates a paper where means and standard deviations were not provided in text or table format, and where effect sizes had to be derived from test or descriptive statistics (based on Smith, Glass and Miller, 1980).

### *Quantitative data synthesis*

For every study, we calculated an effect size (ES) for each comparison between the intervention of interest (i.e. hypnosis, suggestions) and a control condition on a distress outcome. If a given study had more than one hypnosis condition (e.g. direct hypnosis, indirect hypnosis) or more than one control condition (e.g. attention control, standard care) then an ES was computed for each combination of hypnosis condition and control condition. If a given study had multiple measurements of emotional distress (e.g. at different post-intervention time points, or different outcome measures) an effect size was calculated for each. Effect sizes were not calculated for time points prior to the administration of the intervention.

The effect sizes were calculated using the meta-analysis program by Schwarzer (Schwarzer, 2008) (using the '*Effect Sizes d*' utility). The effect sizes generated from this utility are *g*, where $g = (M_c - M_e)/SD$. In this equation, $M_c$ represents the mean of the control group on the outcome variable, $M_e$ represents the mean of the experimental group on the outcome variable, and *SD* represents the pooled standard deviation of the two groups. If a given study did not present means and standard deviations, then the ES was calculated based on test or descriptive statistics following methods suggested by Smith and colleagues (Smith et al., 1980). For ease of interpretation, effect sizes are positive if the hypnosis intervention had the desired beneficial outcome (e.g. less distress or more relaxation), and negative if the hypnosis intervention had the opposite of the desired effect (e.g. more distress or less relaxation).

Once the initial set of effect sizes was generated, a mean effect size for each comparison, for each study, was calculated. This was done by taking the mean of all of the relevant effects for that comparison (i.e. across distress outcome variables).

The effect sizes were then averaged using the meta-analysis program by Schwarzer (2008). The results produced include not only an unweighted overall effect size, but also

 
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an effect size weighted by sample size produced using a random effects model (delta). Both statistics will be reported, since the random effects model does not assume that the set of effect sizes is homogeneous, and we expected the set of effects to display heterogeneity. Additionally, it has been recommended to use the random effects model, as this model is more generalizable to the broader population of studies (Rosenthal and DiMatteo, 2001).

The results yielded by the programme also address two important concerns: the homogeneity of the set of effects, and the 'file-drawer' problem. Homogeneity of the set of effects is critical, as it indicates the trustworthiness of the overall effect size generated by the meta-analysis (Schwarzer, 2008). To examine homogeneity of the effect sizes, we will examine the percentage of variance attributable to sampling error versus the percentage of variance attributable to systematic factors, as well as the *Q* statistic. The *Q* statistic indicates whether the variability present in the group of effect sizes is significantly greater than chance, and thus suggestive of the presence of potential moderators of intervention effects. To examine publication bias, otherwise known as the 'file-drawer problem,' we used Orwin's (1983) method. Moderator analyses following a finding of heterogeneity of effect sizes (a significant *Q* value), were conducted by analyses of variance.

## Results

### *Description of trial, sample and intervention characteristics*

The 26 randomized trials meeting the inclusion criteria yielded 36 effect sizes. Table 1 presents the chief characteristics and effect sizes for each trial. It should be noted that these are *g* values, not Cohen's *d* values, and therefore may not be identical to the published *d* values in the original manuscripts.

The trials were published between 1984 and 2008. The age range of participants was from 4.8 years to 70.3 years. Sample size ranged from 20 to 200. As can be noted from Table 1, the intervention timing and delivery varied across studies. Outcomes assessed in the studies included anxiety (17 studies), general distress or mood disturbance (6 studies), depression (5 studies), behaviour disorders/distress behaviours (4 studies), relaxation (3 studies), tension (2 studies), anger (1 study), fear (1 study), crying (1 study), how traumatic the procedure was considered (1 study) and nervousness (1 study).

### *Quantitative data synthesis: effectiveness of hypnosis compared with control conditions*

The aggregated effect sizes demonstrate that hypnosis had a significant, large and beneficial effect on emotional distress related to medical procedures. Using a random effects model, we found a mean effect size of 0.88 ($SE = 0.16$, 95% $CI = 0.57$ to 1.19), and this value was significantly greater than zero ($z = 5.58$, $p < 0.0001$).

As noted above, the effect sizes used for this analysis were all drawn from published, peer-reviewed journals, which may raise concerns about publication bias. To address this concern, we calculated the number of studies with an effect size of zero required to decrease the overall mean effect size to small or medium (based on Orwin, 1983), and created a funnel plot (Figure 2). Results indicated that 28 studies with effect sizes of zero would be needed to reduce the large intervention effect size of 0.88 found here to a medium effect size of 0.50, and that 123 studies with effect sizes of zero would be needed to reduce the present effect size of 0.88 to a small effect size of 0.20.



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**Table 1.** Study characteristics and mean effect sizes (Hedges' *g*)

| Study | Procedure | Method[a]/Timing[b] of Hypnosis Intervention | Intervention Label[c] | Type of Control Condition[d] | *n* | Children vs. Adults[e] | ES (*g*) |
|---|---|---|---|---|---|---|---|
| Ashton et al. 1995 | Coronary artery bypass | Live/Pre | Hypnosis | Standard care | 22 | Adults | 0.46 |
| Blankfield et al. 1995 | Coronary artery bypass | Recorded/During | Suggestion | Attention control | 63 | Adults | 0.16 |
| Block et al. 1991 | Mixed surgery | Recorded/During | Suggestion | Attention control | 199 | Adults | 0.04 |
| Butler et al. 2005 | Voiding cystourethrography | Live/Pre and During | Hypnosis | Standard care | 44 | Children | 0.44 |
| Calipel et al. 2005 | Lower abdominal surgery | Live/Pre | Hypnosis | Standard care | 50 | Children | 0.65 |
| Cruise et al. 1997 | Cataract surgery | Recorded/During | Suggestion | Attention control | 60 | Adults | 0.30 |
| | Cataract surgery | Recorded/During | Suggestion | Attention control | 59 | Adults | 0.17 |
| de Klerk et al. 2004 | Coronary artery bypass | Live/Pre | Hypnosis | Standard care | 50 | Adults | 0.93 |
| Faymonville et al. 1997 | Plastic surgery | Live/During | Suggestion | Standard care | 56 | Adults | 0.05 |
| Goldmann et al. 1988 | Gynecologic surgery | Live/Pre | Hypnosis | Standard care | 52 | Adults | 0.92 |
| Harandi et al. 2004 | Physiotherapy with burn patients | Live/Pre | Hypnosis | Standard care | 44 | Adults and Children | 2.38 |
| Katcher et al. 1984 | Oral surgery | Live/Pre | Hypnosis | Attention control | 32 | Adults | 0.68 |
| Lang et al. 2000 | Interventional radiology | Live/During | Hypnosis | Standard care | 161 | Adults | 0.37 |
| | Interventional radiology | Live/During | Hypnosis | Attention control | 162 | Adults | 0.24 |
| Lang et al. 2006 | Large core breast biopsy | Live/During | Hypnosis | Standard care | 154 | Adults | 0.37 |
| | Large core breast biopsy | Live/During | Hypnosis | Attention control | 160 | Adults | 0.19 |
| Liossi and Hatira 1999 | Bone marrow aspirations | Live/Pre and During | Hypnosis | Standard care | 20 | Children | 1.29 |
| Liossi and Hatira 2003 | Lumbar puncture | Live/Pre and During | Hypnosis (Direct) | Standard care | 40 | Children | 2.64 |
| | Lumbar puncture | Live/Pre and During | Hypnosis (Direct) | Attention control | 40 | Children | 2.11 |
| | Lumbar puncture | Live/Pre and During | Hypnosis (Indirect) | Standard care | 40 | Children | 2.66 |
| | Lumbar puncture | Live/Pre and During | Hypnosis (Indirect) | Attention control | 40 | Children | 2.12 |


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**Table 1.** *Continued*

| Study | Procedure | Method[a]/Timing[b] of Hypnosis Intervention | Intervention Label[c] | Type of Control Condition[d] | *n* | Children vs. Adults[e] | ES (*g*) |
|---|---|---|---|---|---|---|---|
| Liossi et al. 2006 | Lumbar puncture | Live Pre and During | Hypnosis | Attention control | 30 | Children | 3.14 |
| | Lumbar puncture | Live/Pre and During | Hypnosis | Standard care | 30 | Children | 3.16 |
| Liu et al. 1992 | Total abdominal hysterectomy | Recorded/During | Suggestion | Attention control | 49 | Adults | 0 |
| | Total abdominal hysterectomy | Recorded/During | Suggestion | Attention control | 50 | Adults | 0 |
| Marc et al. 2007 | Surgical abortion | Live/Pre and During | Hypnosis | Standard care | 29 | Adults | 0.17 |
| Massarini et al. 2005 | Mixed surgery | Live/Pre | Hypnosis | Standard care | 42 | Adults and Children | 0.69 |
| Montgomery et al. 2002 | Excisional breast biopsy | Live/Pre | Hypnosis | Standard care | 20 | Adults | 1.25 |
| Montgomery et al. 2007 | Breast conserving surgery | Live/Pre | Hypnosis | Attention control | 200 | Adults | 1.11 |
| Saadat et al. 2006 | Ambulatory surgery | Live/Pre | Hypnosis | Standard care | 50 | Adults | 2.33 |
| | Ambulatory surgery | Live/Pre | Hypnosis | Attention control | 52 | Adults | 1.69 |
| Schnur et al. 2008a | Excisional breast biopsy | Live/Pre | Hypnosis | Attention control | 90 | Adults | 0.79 |
| Stalpers et al. 2005 | Mixed cancer radiotherapy | Live/Pre and During | Hypnosis | Standard care | 69 | Adults | 0 |
| van der Laan et al. 1996 | Hysterectomy, myomectomy, or GYN laparotomy | Recorded/Pre | Suggestion | Attention control | 40 | Adults | 0.52 |
| Wood et al. 1990 | Tonsillectomy and adenoidectomy | Recorded/During | Suggestion | Attention control | 49 | Children | 0.12 |
| | Tonsillectomy and adenoidectomy | Recorded/During | Suggestion | Attention control | 50 | Children | 0.36 |

*Note:* a) 'live' was defined as an intervention with a live, in-person component, 'recorded' was defined as an intervention with *no* live, in-person component; b) 'pre' was defined as an intervention delivered prior to a medical procedure, 'during' was defined as an intervention delivered during the medical procedure with *no* pre-procedure delivery, and interventions which incorporated both delivery approaches were labeled 'pre and during'; c) 'hypnosis' was defined as the authors using the actual word hypnosis, as well as its derivatives (e.g. hypnotherapeutic ego strengthening), to describe the intervention whereas suggestion was defined as the authors using any derivative of the term suggestion (e.g. therapeutic suggestions); d) 'attention control' was defined as any control condition other than standard care (e.g. blank tape, white noise); e) Child was defined as <age 18.


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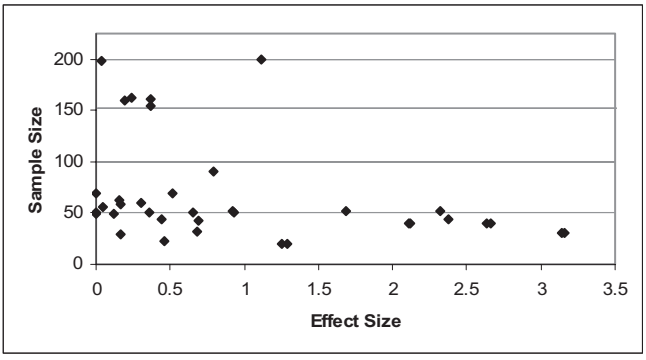


**Figure 2.** Effect size by study sample size (funnel plot).

Results of homogeneity tests indicated that the sample of effect sizes was heterogeneous ($Q = 231.31$, $df = 35$, $p < 0.0001$). Only 12.86% of the variance was explained by sampling error, indicating that 87.14% of the variance was explained by systematic factors. This suggests that moderators are likely to be present.

*Impact of moderators on hypnosis effects*

Based on the degree of heterogeneity in the data set, we proceeded to test potential moderator variables. Table 2 presents the descriptive and inferential statistics for these tests. Results indicate that: a) hypnosis is significantly more effective for children than for adults ($p < 0.001$); b) sample size is significantly and inversely correlated with effect size ($p < 0.05$); c) average effect size does not differ significantly whether hypnosis is compared to an attention control or to a standard care control condition ($p > 0.23$); d) interventions were significantly more effective when labelled 'hypnosis' than when labelled 'suggestion' ($p < 0.002$); e) hypnosis was significantly more effective when it was delivered at least in part using a 'live' administration method as compared to when the intervention was delivered via audio recording ($p < 0.005$); f) hypnosis was significantly more effective when it was delivered at least in part prior to the medical procedure (our Pre and Pre and During conditions) rather than solely during the medical procedure (post-hoc Tukey $p < 0.05$) (see Table 2); and g) effect sizes did not differ significantly between those studies where effect sizes had to be imputed and those studies where effect sizes did not have to be imputed ($p > 0.08$). As can be seen in Table 1, there is a great deal of overlap between the study characteristics of live vs. recorded, the timing of the intervention delivery, and hypnosis label. Studies which were delivered 'live' also tended to be labelled 'hypnosis' and to be delivered prior to the medical procedure, while those which were delivered via recording were more likely to be delivered during the procedure and to be labelled 'suggestion'. The overlapping nature of these factors prevented an analysis of the effects of the moderators using more complex statistical models (e.g. two- and three-way interactions). With regard to the finding that sample size was inversely correlated with effect size, a funnel plot (Figure 2) revealed that this correlation may be driven by one larger sample size study with an effect size of zero (Block, Ghoneim, Sum Ping and Ali, 1991). The correlation between sample size and effect size with this particular study removed was non-significant ($p = 0.08$).



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**Table 2.** Effect sizes and significance tests for moderation effects

| Moderator of interest | $n_{effects}$ | Mean (*SD*) ES by class | Test statistic | *p* |
|---|---|---|---|---|
| Child vs. adult[a] | Child = 11<br>Adult = 23 | Child = 1.70 (1.16)<br>Adult = .55 (.60) | $F(1,33) = 14.62$ | 0.0006 |
| Sample size (continuous) | 32 | | $r = -.34$ | 0.0438 |
| Control condition (standard care vs. attention control)[b] | Standard Care = 18<br>Attention Control = 18 | Standard Care = 1.15 (1.02)<br>Attention Control = 0.76 (0.91) | $F(1,35) = 1.46$ | 0.2352 |
| Label (hypnosis vs. suggestions)[c] | Hypnosis = 26<br>Suggestion = 10 | Hypnosis = 1.26 (0.99)<br>Suggestion = 0.17 (0.17) | $F(1,35) = 11.79$ | 0.0016 |
| Method of hypnosis delivery (live vs. recorded)[d] | Live = 27<br>Recorded = 9 | Live = 1.22 (1.0)<br>Recorded = 0.19 (0.18) | $F(1,35) = 9.34$ | 0.0043 |
| Hypnosis administration time (pre vs. during vs. pre and during)[e] | Pre = 13<br>During = 13<br>Pre and During = 10 | Pre[f] = 1.11 (0.64)<br>During = 0.18 (0.14)<br>Pre and During = 1.77 (1.22) | $F(1,35) = 13.17$ | <0.0001 |
| Imputation[g] | Imputed = 14<br>Not imputed = 22 | Imputed = 0.61 (.70)<br>Not imputed = 1.18 (1.07) | $F(1,35) = 3.09$ | 0.0878 |

*Note:* a) Child was defined as <age 18; b) 'attention control' was defined as any control condition other than standard care (e.g. blank tape, white noise); c) 'hypnosis' was defined as the actual word hypnosis, as well as its derivatives (e.g. hypnotherapeutic ego strengthening), whereas suggestion was defined as any derivative of the term suggestion (e.g. therapeutic suggestions); d) 'live' was defined as an intervention with a live, in-person component, 'recorded' was defined as an intervention with *no* live, in-person component; e) 'pre' was defined as an intervention delivered prior to a medical procedure, 'during' was defined as an intervention delivered during the medical procedure with *no* pre-procedure delivery, and interventions which incorporated both delivery approaches were labeled 'pre and during'; f) Tukey post-hoc tests revealed that mean During effect size was significantly lower than mean effect sizes for Pre or Pre and During ($p < 0.05$). No other comparisons were significantly different ($p > 0.05$); g) 'Imputed' indicates a paper where means and standard deviations were not provided in text or table format, and where effect sizes had to be derived (based on Smith et al., 1980).


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## Discussion

This meta-analysis represents the most extensive review of randomized trials to date on the effects of hypnosis to reduce emotional distress related to medical procedures. The results indicate that approximately 82% of patients undergoing medical procedures who receive hypnosis exhibit lower levels of emotional distress relative to patients in a control condition. The finding of a large effect size in favour of hypnosis supports its more widespread dissemination.

The overall effectiveness of hypnosis for controlling emotional distress associated with medical procedures is consistent with a previous meta-analysis on the effects of hypnosis on negative affect in surgical settings (Montgomery, Weltz, Seltz and Bovbjerg, 2002), which found a hypnosis effect size of 1.07. Effect sizes in the previous meta-analysis may have been larger as the analysis included non-randomized studies and excluded interventions not explicitly labelled as hypnosis. Both the present meta-analysis and the previous one resulted in effect sizes for hypnosis in the large range. The consistency of these findings suggests that hypnosis can improve the patient experience related to medical procedures.

Examination of moderating factors yielded several interesting findings. First, the finding that hypnosis has a medium effect size for adults and a large effect size for children supports the utility of hypnosis regardless of patient age. The finding of a significantly larger clinical effect for children than for adults may be explained by research indicating that children may be more responsive to suggestion (Morgan and Hilgard, 1972). However, it should also be noted that some of the hypnosis interventions delivered to children in the present set of studies tended to be more involved (e.g. more treatment components – self- and hetero-hypnosis, greater number of or longer intervention sessions) than those delivered to adults. Therefore, it is difficult to state with certainty whether the moderation effect is explainable by age differences or by intervention dose differences. Future studies could disentangle this finding by having similarly dosed interventions delivered to both children and adults. Second, the finding that hypnosis appears equally effective whether compared to an attention control group or to a standard care control group suggests that the effects of hypnosis are not merely due to attention. Third, the results indicated that the most effective hypnosis interventions were those that used the label 'hypnosis'. However, these interventions also tended to be delivered both live and prior to medical procedures, making the exact determination of unique moderating effects problematic.

Future research manipulating the label of the hypnosis intervention, the timing of the intervention, and the presentation (live vs. recorded) of the intervention would be helpful in identifying the most effective hypnosis delivery method for medical procedures. From a practical perspective, explicitly labelling interventions as hypnosis has been found to increase clinical effect sizes (Schoenberger, Kirsch, Gearan, Montgomery and Pastyrnak, 1997). Using the label 'hypnosis' may be an efficient clinical approach for increasing patient benefit. Lastly, the results indicated that studies with larger sample sizes tended to have smaller effect sizes, due in part to a few small studies with extremely large effect sizes, and one particular large sample size study with an effect size of zero. One might speculate that there were a greater number of smaller sample size studies with larger ESs, as authors may have stopped their trials once beneficial effects were clearly evident.

Table 1 can be used to clarify clinical research areas which have received greater attention to date (e.g. coronary artery bypass surgery), and more importantly, those

 
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which remain in need of further empirical study. For example, no clinical trials were identified that focused on the use of hypnosis to reduce distress related to non-invasive imaging procedures (e.g. MRI, CT scan) or to relatively newer procedures (e.g. stereotactic radiosurgery, brachytherapy). Similarly, only one study focused on radiotherapy, one of the three standard oncology treatments. Finally, the vast majority of the studies assessed the reduction of negative emotions (a critical outcome), whereas few assessed any positive emotions which might result from hypnosis (e.g. calm, relaxation, joy, self-confidence). As a result, the literature may be telling only half the story of the benefits of hypnosis for medical procedures.

One limitation of this meta-analysis is that we were unable to address the question of the potential moderating effects of hypnotic suggestibility, as too few papers reported these data. Although an important consideration, the overall effect size documented here suggests that the vast majority of patients can benefit from a hypnosis intervention to reduce distress related to medical procedures, regardless of level of hypnotic suggestibility.

In summary, the data strongly support the use of hypnosis as a non-pharmacologic intervention to reduce emotional distress associated with medical procedures, and suggest that the more widespread adoption of hypnosis could improve the quality of life of millions of patients undergoing medical procedures.

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