

ORIGINAL ARTICLE

The Efficacy, Safety and Applications of Medical Hypnosis

A Systematic Review of Meta-analyses

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SUMMARY

Background: The efficacy and safety of hypnotic techniques in somatic medicine, known as medical hypnosis, have not been supported to date by adequate scientific evidence.

Methods: We systematically reviewed meta-analyses of randomized controlled trials (RCTs) of medical hypnosis. Relevant publications (January 2005 to June 2015) were sought in the Cochrane databases CDSR and DARE, and in PubMed. Meta-analyses involving at least 400 patients were included in the present analysis. Their methodological quality was assessed with AMSTAR (A Measurement Tool to Assess Systematic Reviews). An additional search was carried out in the CENTRAL and PubMed databases for RCTs of waking suggestion (therapeutic suggestion without formal trance induction) in somatic medicine.

Results: Out of the 391 publications retrieved, five were reports of meta-analyses that met our inclusion criteria. One of these meta-analyses was of high methodological quality; three were of moderate quality, and one was of poor quality. Hypnosis was superior to controls with respect to the reduction of pain and emotional stress during medical interventions (34 RCTs, 2597 patients) as well as the reduction of irritable bowel symptoms (8 RCTs, 464 patients). Two meta-analyses revealed no differences between hypnosis and control treatment with respect to the side effects and safety of treatment. The effect size of hypnosis on emotional stress during medical interventions was low in one meta-analysis, moderate in one, and high in one. The effect size on pain during medical interventions was low. Five RCTs indicated that waking suggestion is effective in medical procedures.

Conclusion: Medical hypnosis is a safe and effective complementary technique for use in medical procedures and in the treatment of irritable bowel syndrome. Waking suggestions can be a component of effective doctor–patient communication in routine clinical situations.

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Hypnosis for purposes of medical treatment goes back a long way. The British Medical Association endorsed the use of hypnosis in somatic medicine in 1955, on the basis of case reports and series backed up by expert consensus, and the American Medical Association followed suit in 1958 (1, 2). Whether robust evidence exists for the efficacy and safety of hypnosis in somatic medicine in the era of evidence-based medicine (EBM) (3) remains to be clarified. Because systematic reviews with quantitative analysis (meta-analyses) of randomized controlled trials provide the highest level of evidence in EBM (3), we decided to carry out a systematic review of meta-analyses on medical hypnosis.

The aims of this article are as follows:

- To define the various forms of hypnosis
- To describe the requirements that have to be fulfilled before therapeutic hypnosis can be carried out
- To provide a historical overview of the use of hypnosis in medicine and the assessment of its efficacy
- To identify the indications for medical hypnosis supported by robust evidence
- To present the evidence for use of positive suggestions as a component of effective doctor–patient communication.

Definitions

The term “hypnosis” is used to mean both an altered state of consciousness (synonym: hypnotic trance) and the procedure by which this state is induced (4). During a hypnotic trance physiological, cognitive, and affective processes as well as behavior can be modified. A hypnotic state and hypnotic phenomena can be induced by another person (therapist) or alone (self-hypnosis). The subjective experience of hypnosis is characterized by a high degree of authenticity (experienced as real) and involuntariness (“it happens by itself”) (4).

Hypnosis can be distinguished from other states of consciousness such as normal wakefulness, sleep, deep relaxation, or meditation by means of electroencephalography (EEG) and imaging modalities (4). A hypnotic trance is characterized by a number of physiological

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and mental reactions, e.g., altered perception of time, selective amnesia, regression to a younger age (retrieval of memories or experiences from an earlier developmental stage), a marked inward focus, and heightened suggestibility, i.e., a stronger reaction to suggestions (4). In clinical situations associated with high affective participation of the patient, such as emergencies, diagnostic and therapeutic interventions, or communication of a serious diagnosis, hypnotic phenomena may occur spontaneously (e1, e2).

Suggestions work via verbal and nonverbal signals that correspond to internal expectations and have a powerful effect on mental and involuntary somatic processes. For example, cutaneous perfusion or the flow of saliva is not amenable to influence by a deliberate intellectual action, but can be affected by a suggestion, e.g., a picture or a story. In general use the word “suggestion” tends to imply manipulation, but in hypnosis it should be understood as meaning a proposal, an offer of options (“I suggest”). In contrast to the widespread preconceptions, hypnosis is not authoritarian, passive, and centered around the therapist, but a resource- and solution-oriented method in which the focus is on the patient's own potentials (4).

Applications of hypnosis

Depending on the goals, various applications of hypnotic techniques can be distinguished (4):

- Medical hypnosis
 - Alleviation of somatic symptoms
 - Reduction of mental stress during medical treatment
 - Amelioration of disordered physiological/biochemical parameters
 - Facilitation of physiological/biochemical healing processes
- Hypnotic communication
 - Waking suggestions (suggestions without trance induction)
 - Suggestions with the patient under general anesthesia
 - Use of findings from hypnotherapy for effective doctor–patient communication
- Hypnotherapy (psychotherapy with the patient in a trance)
 - Improvement of problem management by giving the patient access to their own resources
 - Facilitation of changes in behavior
 - Restructuring (minimization, reinforcement, new conditioning) of cognitive–affective patterns
 - Restructuring of emotionally stressful events and sensations
 - Reintegration of non-accessible (dissociated) feelings
- Experimental hypnosis
 - Basic research on somatic sensations (e.g., pain), emotions, and states of consciousness
- Stage hypnosis
 - Demonstration of hypnotic phenomena to entertain an audience

The perception of hypnosis as an authoritarian, manipulative technique, nourished particularly by its use in stage shows, represents the greatest barrier to the (re)integration of hypnosis into medical treatment.

Phases of medical hypnosis

A session of medical hypnosis generally lasts between 20 and 50 min and can be divided into various phases (4):

- Verification of the indication; explanation (correction of inappropriate anxiety or false expectations); definition of goal(s)
- Induction
- Consolidation
- Therapeutic suggestions
- Reorientation, posthypnotic suggestions
- Discussion
- Integration into daily routine: use of an audio file at home; behavioral exercises (e.g., exposure training); possibly learning of self-hypnosis techniques.

A selection of broadcasts (mostly in German) publicly available on the internet can be found in *eBox 1*.

Formal requirements

In Israel and Sweden, hypnosis may be carried out only by physicians and psychologists who have received appropriate training. In Germany, from the legal point of view, anyone can offer hypnosis for non-medical reasons. Treatment of illness by means of hypnosis requires a license to perform procedures for the purpose of healing (medical and psychological psychotherapists, child and adolescent psychotherapists, naturopaths) (e3). Medical hypnosis can be carried out by physicians of all patient-related specialties in the framework of basic psychosomatic care. An invoice for relaxation hypnosis according to the official German schedules for physicians' fees (Uniform Value Scale, *Einheitlicher Bewertungsmaßstab*) can be submitted only by persons who possess a qualification in basic psychosomatic care and have successfully completed a course in hypnosis comprising two units of 16 hours each (e4). Most medical and psychological psychotherapists and child and adolescent psychotherapists learn the techniques of hypnotherapy as a supplementary qualification. As a rule hypnotherapists are also trained in other methods of psychotherapy.

Details of the history of hypnosis and assessment of its efficacy prior to the introduction of evidence-based medicine (EBM) are provided in *eBox 2*.

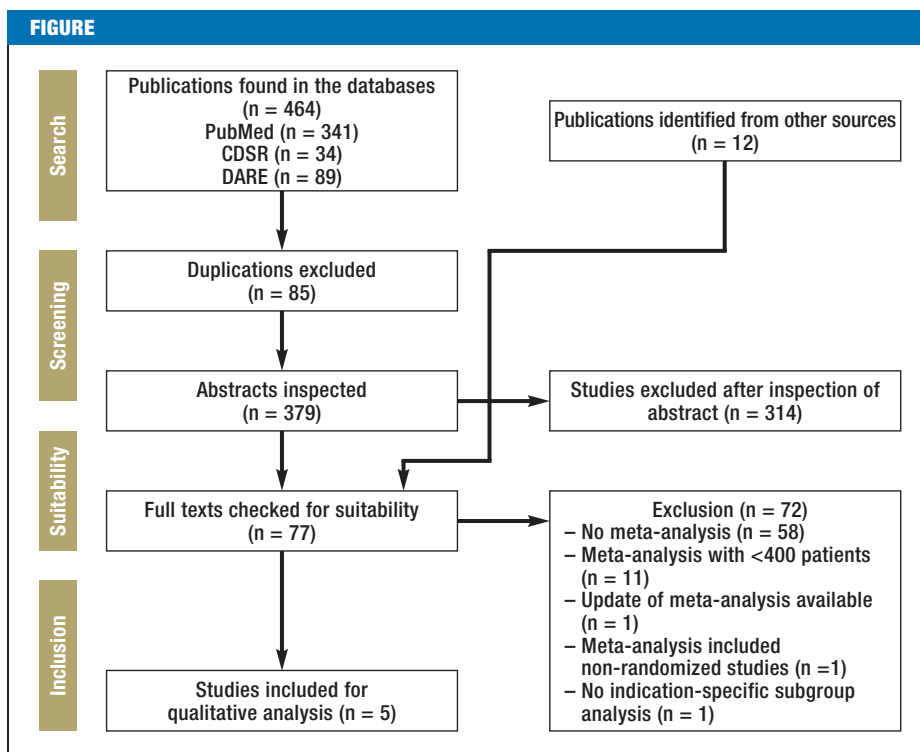
Evidence for efficacy and safety

Methods

This review was conducted according to the recommendations of the Cochrane Collaboration for systematic reviews of previously published reviews and the recommendations of the Joanna Briggs Institute for umbrella reviews (6).

Systematic survey of the literature

The Cochrane databases CDSR and DARE and PubMed were searched for systematic reviews (SRs)



Results of the literature survey

published in the period January 2005 to June 2015. The following search terms were used: “review,” “meta-analysis,” and “hypnosis”. We searched PubMed with “((“hypnosis”[MeSH] OR “hypnosis, dental”[MeSH]) AND (“meta-Analysis” [Publication Type] OR “review” [Publication Type])) OR ((hypnosis OR hypnotherap*) AND (meta-analy* OR metaanaly*))”. Moreover, the reference lists of the SRs identified were inspected for further SRs. With regard to waking suggestions we searched the databases CENTRAL and PubMed for randomized controlled trials (RCTs) using the terms “suggestion” [MeSH] and “hypnotic suggestion”. Finally, for all topics we asked experts in medical hypnosis about SRs.

Inclusion criteria

The following conditions regarding study type, indications, setting, and study population had to be fulfilled:

Study type: We included SRs with meta-analysis of (quasi-)RCTs on hypnosis as intervention for somatic medical indications. In the event of serial publications by the same group of authors we used the most recent publication. We selected inclusion of at least 400 patients in quantitative analysis (meta-analysis) of the study results as a quantitative criterion of robust evidence (7).

Indications: The endpoints of the meta-analysis had to be somatic symptoms (e.g., pain or nausea) or physiological findings (e.g., bleeding time or airway

resistance) and/or mental stress during medical treatments and/or cost-related data (e.g., operating time, length of hospital stay, or drug consumption). We excluded meta-analyses of RCTs on psychiatric and psychotherapeutic indications (e.g., anxiety disorders, depressive disorders, addiction/abuse, or behavioral disorders) and meta-analyses of RCTs on various diseases (e.g., psychosomatic illnesses) in which no subgroup analyses were conducted for individual diseases.

Setting and study population: No restrictions were imposed with regard to setting, age, or country.

Methodological quality

The methodological quality of the meta-analyses was verified using AMSTAR (A Measurement Tool to Assess Systematic Reviews) (8). AMSTAR scores of 0–4 were classified as low, 5–8 as intermediate, and 9–11 as high methodological quality (9).

Data extraction

The following characteristics of the meta-analyses were extracted independently by two of the authors (WH, MH) and discrepancies were resolved by consensus:

- The medical indication
- The number of RCTs/patients included
- The age and sex of the patients
- The type and duration of hypnosis
- The nature of the control group
- The instrument for and results of measurement of methodological quality of the included RCTs

TABLE 1

Characteristics of the randomized controlled studies of medical hypnosis included in the meta-analyses*

Reference	Medical indication	Number of studies/patients (sample size range)	Patients' age and sex	Type and duration of hypnosis	Type of control groups	Methodological quality of the studies
Kekecs et al. 2014 (10)	Minor (n = 11), major (n = 14), or unspecified (n = 1) surgical interventions	26/1890 (12–346)	Children and adults, no further details	13 studies with hypnosis, 11 studies with therapeutic suggestions, 2 studies with both; 13 studies with live hypnosis and 13 studies with ready-made audio files; no data on duration	Standard treatment or attention control	Cochrane Risk of Bias Tool: relatively high risk of bias in the studies
Madden et al. 2012 (11)	Pain during labor and childbirth	7/1213 (38–520)	Adult women in six studies; minors in one study	6 studies on prenatal classes (3 in groups and 3 in an individual setting) with at least 3 sessions; 1 study with 45 min (live) during contractions	Standard treatment (i.e., prenatal instruction) or attention control (supportive treatment)	Cochrane Risk of Bias Tool: 1 study with low and 6 studies with moderate to high risk of bias
Schaefer et al. 2014 (12)	Irritable bowel	8/464 (24–91)	Adults; range of mean age 36.3–42 years (median 39.8); average proportion of women: 82 % [79.3; 86.5]	Median 8.5 (7–12) live hypnosis sessions over median 12 (5–12) weeks, median treatment duration 7 (2.5–12) h; 7 studies with individual sessions and 1 study with group sessions	Standard treatment, waiting list or attention control (education, supportive treatment)	Cochrane Risk of Bias Tool: 6 studies with low and 2 studies with high risk of bias
Schnur et al. 2008 (13)	Medical interventions	26/2342 (20–200)	4.8–70.3 years; no data on sex distribution	7 studies with therapeutic suggestions; 20 studies with live hypnosis, 6 studies with ready-made audio files; no data on frequency and duration of sessions	Standard treatment or attention control	No data
Tefikow et al. 2013 (14)	Medical interventions	34/2597 (16–347)	Adults; median age 40 years; median proportion of men 40% (experimental groups), 37% (control groups)	21 studies with live hypnosis, 9 studies with ready-made audio files, 4 studies with both; duration of intervention: 3–20 min: 9 studies 21–110 min: 17 studies 110–240 min: 8 studies	Standard treatment or attention control	Cochrane Risk of Bias Tool: most studies with high or unclear risk of bias

* The meta-analyses are listed in alphabetical order

- The databases searched and the period covered
- The findings regarding efficacy, tolerance, and safety
- The authors' conclusions
- The AMSTAR rating.

Given the heterogeneity of diseases and outcome variables, no quantitative data synthesis was planned from the outset.

Results: survey and inclusion

The database survey and the hand search identified 391 publications in total. Seventy-seven full texts were examined in detail (Figure). Fourteen meta-analyses (on topics such as chemotherapy-induced nausea and vomiting, fibromyalgia syndrome, and temporomandibular disorder) were excluded from analysis because they included fewer than 400 patients in their calculations (eTable 1) (e11–e24). Five meta-analyses were included in our qualitative review (10–14). The methodological quality was high in one

meta-analysis, intermediate in three, and low in one (eTable 2). The characteristics of the original articles investigated in these five meta-analyses are outlined in Table 1.

Results: efficacy and safety

Hypnosis was superior to standard treatment or attention control (controls) in reduction of emotional stress, (10, 13, 14), pain (10, 14), duration of convalescence, and drug consumption (10) in interventional procedures and operations. The effect size on emotional stress varied: it was slight in one meta-analysis (10), intermediate in another (14), and high in a third (13). The effect size on pain reduction was low (10, 14). The effect sizes of hypnosis in medical interventions were dependent on the methodological quality of the original studies (10, 14).

Gut-directed hypnosis was superior to the treatments used in the control groups with regard to the number of patients with an appropriate reduction of symptoms at the end of treatment (number needed to treat [NNT] 5) and at

TABLE 2

Results of the meta-analyses of randomized controlled trials on medical hypnosis*

Reference	Databases and period covered by literature survey	Results for efficacy [95 % CI]; number of studies/patients (no data on number of studies/patients per outcome variable)	Results for tolerability and safety [95% CI]; number of studies/patients
Kececs et al. 2014 (10)	PubMed, PsycINFO, CINAHL, ProQuest from 1980 to February 2014	Postoperative anxiety: SMD 0.40 [0.13; 0.66]; 21/1479 Postoperative pain: SMD 0.25 [0.00; 0.50]; no p-value given; 15/1197 Postoperative consumption of painkillers: SMD 0.16 [-0.16; 0.47], ns; 12/854 Postoperative nausea: SMD 0.38 [-0.06; 0.81], ns at α -level of $p < 0.01$; 16/647	No data
Madden et al. 2012 (11)	Cochrane Pregnancy and Childbirth Group's Trials Register/Central, PubMed, Embase up to January 2012	Drug treatment for pain: RR 0.63 [0.39; 1.01], ns; 6/1032 Spontaneous vaginal delivery: RR 1.35 [0.93; 1.96], ns; 4/472 Satisfaction with pain reduction: RR 1.06 [0.94; 1.20], ns; 1/264	Resuscitation of newborns: RR: 0.67 [0.11; 3.96], ns; 1/520 Intensive care of newborns: RR: 0.58 [0.12; 2.89], ns; 2/347 Intensive care of mothers: RR: 1.47 [0.25; 8.68], ns; 1/305 Inpatient re-admission of newborns: RR: 1.39 [0.64; 3.02], ns; 1/267
Schaefer et al. 2014 (12)	Allied und Complementary Medicine Database, Central Register of Controlled Trials, CINAHL, PubMed, PsycINFO, Scopus up to June 2013 (restricted to studies published in journals)	<u>At end of treatment:</u> Adequate reduction of symptoms: RR 1.69 [1.14; 2.51]; NNT 5 [3; 10]; 5/280 Reduction of global gastrointestinal symptoms: SMD 0.32; [0.08; 0.56]; 6/361 <u>Follow-up (6 months):</u> Adequate reduction of symptoms: RR 2.17 [1.22; 3.87]; NNT 3 [2; 10]; 1/90 Reduction of global gastrointestinal symptoms: SMD 0.57 [-0.26; 1.40], ns; 2/171	Data from five studies: one patient reported dizziness, but continued treatment; one patient discontinued treatment due to a panic attack during hypnosis
Schnur et al. 2008 (13)	PsycINFO and PubMed from beginning to February 2008 (restricted to English-language studies published in journals)	Emotional stress: SMD 0.88 [0.57; 1.19]; 26/2342	No data
Tefikow et al. 2013 (14)	Central, PubMed, Web of Science, ProQuest up to September 2011	Emotional stress: SMD 0.53 [0.37; 0.69] Pain: SMD 0.44; [0.26; 0.61] Drug consumption: SMD 0.38 [0.20; 0.56] Physiological parameters: SMD 0.10 [0.02; 0.18]; ns Duration of convalescence: SMD 0.25 [0.04; 0.46] Operation time: SMD 0.25 [0.12; 0.38]; ns	No data

* The meta-analyses are listed in alphabetical order
CI, confidence interval; ns, not significant; p, probability; RR, relative risk; SMD, standardized mean difference; NNT, number needed to treat

follow-up 6 months later (NNT 3) (12). Hypnosis was not more effective than standard treatment or attention control for pain during labor and childbirth (11).

Evaluation of the data on safety of hypnosis in two meta-analyses (pain during labor and childbirth, irritable bowel syndrome) (11, 12) revealed no signs of a higher rate of adverse effects than in controls (Table 2).

Discussion of the results can be found in eBox 3.

Applications of hypnosis in daily clinical practice

Preparation and performance of interventions

Anesthesia and surgery: The use of hypnosis instead of local anesthesia in dental surgery (e25) and in place of anesthesia for more extensive surgery (cholecystectomy, aortocoronary bypass operation) has been described in case reports (e26). However, hypnosis is being routinely used as a complement rather than an alternative to modern, safe techniques of anesthesia, primarily to minimize anxiety and stress. Hypnosis has been shown to reduce pain, anxiety,

and the consumption of analgesics and sedatives to a statistically significant extent in patients undergoing operations under local or regional anesthesia (e27, e28).

An example of the efficacy of hypnotic communication—even without formal trance induction—is its application in waking craniotomies, as performed for instance for removal of a brain tumor close to the speech area or for deep brain stimulation. In these procedures the patient receives regional anesthesia of the head and remains awake for the whole duration of the brain surgery for purposes of neurological testing, with no need for sedation and additional analgesia. Dissociation to an inner place of tranquility away from the operating room plays an important part, as does the reinterpretation of sensory perceptions (e29).

Some German hospitals offer live or audio file-aided hypnosis as a complement to general and regional anesthesia.

Gastroenterology: With the aid of hypnosis—e.g., self-hypnosis or hypnosis by means of audio files—

TABLE 3

Examples of positive waking suggestions at premedication and before induction of anesthesia (modified from [18, 19])

Positive statements instead of negations	"Everything will be fine" "We'll do this together" rather than "You don't need to worry."
Use of positive suggestions (safety, support, well-being)	"We'll keep a close eye on you until you've completely recovered from the operation."
Combine explanations with positive suggestions	"We're attaching a blood pressure cuff and ECG leads so we can take good care of you."
Combine information about procedures with positive suggestions	"After the operation you can stay in the recovery room until you wake up naturally, and when you feel well enough we'll take you back to your room."
Combine references to the patient's autonomy with positive suggestions	"You can help us to increase the safety of the anesthesia by not eating anything for 12 hours before the operation."
Combine information about possible complications with positive suggestions	"Please tell us straightaway if you get a headache after the spinal anesthesia. We have good medication for treating this kind of headache."

diagnostic esophagogastroduodenoscopy procedures can be carried out without sedation (e30). The use of audio files is also efficacious in irritable bowel syndrome (e31). These files can be given to patients with irritable bowel syndrome by their primary care physician or internist, and the progress with regard to symptom control can be discussed with the patients in the framework of basic psychosomatic care (e32). This approach can greatly facilitate the clinical application of hypnosis. Gastroenterology departments in Great Britain (e33), Austria (e34), and the USA (e35) have integrated psychosocial services that offer live and audio file-aided hypnosis to patients with functional gastrointestinal disorders who do not respond well to conventional medicinal treatment (see *eBox 1* for more on gut-directed hypnosis). Some office-based gastroenterologists in Germany offer hypnosis as an alternative to sedation in esophagogastroduodenoscopy.

Dentistry: The German Dental Hypnosis Society (*Deutsche Gesellschaft für Zahnärztliche Hypnose*) has trained around 3000 dentists in hypnosis. The society's website lists over 600 dentists who offer this service to their patients. The indications for which hypnosis is available are pronounced fear of dental treatment, gag reflex, intolerance of local anesthetics, and craniomandibular dysfunction. Hypnosis in the following forms is offered (e25):

- The use of CDs developed specially for dental treatment (e.g. "*Beim Zahnarzt ohne Spritze* [Dental surgery without injection]"). At the beginning of the treatment session track 1 is played repeatedly over headphones, and at the end of treatment the patient is woken by track 2.
- Delegation of the hypnosis to a trained member of staff (hypnosis assistant). In this case the dentist must also be trained in hypnosis, because he/she is responsible for the patient's welfare and must be able to deal with the rare cases of adverse reaction to hypnosis.
- Induction of hypnosis by the dentist him-/herself. This takes 2 to 5 min for relaxation prior to an

injection, about 10 min for treatment without local anesthesia.

- It is advantageous to combine nitrous oxide and hypnosis, because the gas has an anxiolytic effect and increases suggestibility.
- Some dentists who concentrate on treatment of patients with anxiety or craniomandibular dysfunction draw on the services of an external hypnotist.

Live hypnosis versus audio file-aided hypnosis

A meta-analysis of hypnosis in medical interventions demonstrated no significant differences in efficacy between live hypnosis and suggestion by means of audio files (14). Another meta-analysis by a different group of authors concluded that only live hypnosis, which is more apt to provide the context of a personal relationship, significantly reduced postoperative anxiety and pain. Both live and audio file-aided hypnosis significantly decreased postoperative nausea and consumption of analgesics (10).

Waking suggestions in doctor-patient communication

The German Medical Assembly 2015 spoke out in favor of strengthening physicians' communicative competence (15). In our opinion, together with authentic and empathetic interaction (16), effective doctor-patient communication has to include avoidance of negative suggestions (16-19) and targeted use of positive waking suggestions (18). In this context, communication could be improved by applying basic principles of hypnotherapy such as employment of indirect suggestions and the establishment of a trusting doctor-patient relationship (rapport). Three RCTs on invasive radiological procedures found that positive suggestions and empathy, with and without techniques of self-hypnosis, were superior to the standard treatment in reducing pain and anxiety and in decreasing consumption of analgesics (20-22). In two RCTs, neutral or positive instructions before blood sampling ("I'm going to start taking the blood sample now") or

BOX

Potential applications of medical hypnosis in daily clinical practice (case reports and/or case series)

- **All patient-related areas: waking suggestions**
 - Explanation of diagnosis and treatment (e36)
 - Communication before and during medical treatment (19)
 - Emergency service (e37)
- **Anesthesia**
 - Communication with children before operations and local procedures (e38)
 - Therapeutic suggestions during general anesthesia (e26)
 - Therapeutic communication during craniotomies performed with the patient awake (e39)
- **Gastroenterology**
 - Waking suggestions instead of analgesia/sedation in diagnostic esophagogastroduodenoscopy (e30)
 - Gut-directed hypnosis in irritable bowel syndrome (e32)
- **Dentistry**
 - Information, motivation, and supervision on use of audio files with suggestions for the preparation and conduct of medical procedures: dental surgery (e40), maxillofacial surgery (e41), dental treatment (e25)
- **Psychosomatic medicine**
 - Psychotherapy for pain management: chronic non-cancer and cancer pain (e42, e43)
 - Component of psychotherapeutic measures in hospital consultation and advisory services, e.g., in gynecology (e44), palliative medicine (e45), and transplant surgery (e46)
 - Dentistry: fear of the dentist, strong gag reflex, fear of dental materials and injections, allergy to local anesthetics, intolerance of implants, parafunctions, temporomandibular dysfunction) (e40, e47)

induction of local anesthesia led to lower levels of pain than (unintended) negative suggestions (“this may hurt a bit”) (23, 24). A RCT in a hospital emergency room found that the pain-relieving effect of intramuscular diclofenac was not reinforced by a waking suggestion (“this is a powerful painkiller”) in patients with acute headache (25) (eTable 3). Therapeutic waking suggestions can be used by all physicians in a medical context (see Table 3 for examples).

Psychosomatic medicine

Examples of the application of medical hypnosis by psychotherapists in somatic medicine are given in the Box.

Conclusion

Hypnosis techniques have long been used—and their efficacy assessed—in somatic medicine. The modern evidence-based indications (emotional stress associated with medical interventions, functional disorders such as irritable bowel syndrome) correspond with the applications of mesmerism in medicine in the middle of the 19th century (e5). Learning techniques of self-hypnosis empowers patients to participate in their own treatment and grants them independence. Hypnosis techniques such as the building of a trusting relationship with the patient and therapeutic waking suggestions can considerably reinforce the communicative competence of physicians (15).

Conflict of interest statement

Dr. Häuser receives royalties from the sale of CDs on medical hypnosis in irritable bowel syndrome and fibromyalgia syndrome from Hypnos Verlag. He is an instructor for hypnosis of the German Society for Medical Hypnosis and Autogenous Training (Deutsche Gesellschaft für Ärztliche Hypnose und Autogenes Training).

Dr. phil. Dipl.-Psych. Hagl has received honoraria for authorship or co-authorship of yearly reviews of hypnosis research from the Milton H. Erickson Society for Clinical Hypnosis (Milton H. Erickson Gesellschaft für Klinische Hypnose).

Dr. Schmierer has received an honorarium for authorship or co-authorship from Quintessenzverlag (dental hypnosis).

Prof. Hansen is a member of the scientific advisory board of the Milton H. Erickson Society for Clinical Hypnosis (Milton H. Erickson Gesellschaft für Klinische Hypnose).

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KEY MESSAGES

- Medical hypnosis comprises the use of hypnotic techniques, with or without induction of a trance.
- Robust evidence (from meta-analysis of randomized controlled trials including at least 400 patients) of the efficacy of medical hypnosis exists for reduction of pain and emotional stress, duration of interventions, drug consumption during medical interventions, and reduction of irritable bowel symptoms.
- The preparation and conduct of medical interventions can be facilitated by hypnosis.
- Waking suggestions, taking advantage of patients' heightened suggestibility, have a pain-reducing effect in diagnostic and therapeutic interventions.
- Hypnotic techniques such as the creation of a trusting relationship with the patient and therapeutic waking suggestions can be used in daily clinical practice by all physicians and dentists and can form an effective component of overall doctor–patient communication.

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 [Supplementary material](#)
 For eReferences please refer to:
www.aerzteblatt-international.de/ref1716

eBoxes and eTables:
www.aerzteblatt-international.de/16m0289

Supplementary material to:

The Efficacy, Safety and Applications of Medical Hypnosis

A Systematic Review of Meta-analyses

by Winfried Häuser, Maria Hagl, Albrecht Schmierer, and Ernil Hansen

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eBOX 1

Selection of German-language videos and podcasts from public broadcasters on medical hypnosis

- **3Sat 2015**
Hypnosis in irritable bowel syndrome (gut-directed hypnosis): www.youtube.com/watch?v=AjBHaKq8B_g (6 min)
- **ZDF Abenteuer Wissen 2009**
Medical hypnosis in the treatment of chronic pain and in surgery: www.youtube.com/watch?v=MdLQvrl84hU
Plastic surgery, dental treatment (12 min)
- **ARD W wie Wissen 2014**
The power of hypnosis: <http://www.daserste.de/information/wissen-kultur/w-wie-wissen/videos/die-kraft-der-hypnose-100.html>
Dental treatment, brain MRI showing how hypnosis alleviates pain, brain surgery with the patient awake (7 min)
- **SWR Odysso 2014**
Medicine: The healing power of the psyche: <http://www.swr.de/odysso/medizin-die-heilkraft-der-psyche/-/id=1046894/did=14145774/nid=1046894/wrks2i/index.html>
Documentary on healing thoughts; the importance of waking suggestions and a positive attitude for the success of heart surgery (46 min)
- **SWR Odysso 2011**
Hypnosis instead of general anesthesia: <http://www.swr.de/odysso/hypnose-statt-vollnarkose/-/id=1046894/did=7345782/nid=1046894/3hlni/index.html>
The anesthesia technique of hypnosedation, successfully used in over 8000 surgical patients in Belgium. This technique combines hypnosis with very light sedation and local anesthesia; the patient remains awake.
- **WDR Planet Wissen 2016**
How negative thinking makes us ill: www1.wdr.de/mediathek/video/sendungen/planet-wissen-wdr/video-wie-uns-negative-gedanken-krank-machen-100.html
Video about placebo and nocebo effects (58 min)
- **3sat 2012**
Hypnosis instead of anesthesia: www.3sat.de/mediathek/?display=1&mode=play&obj=30167
Maxillary surgery on hypnosdated patients (5 min)
- **BBC exklusiv**
www.youtube.com/watch?v=qJAnCLIBBus&feature=youtu.be
Surgery with hypnosis instead of anesthesia; experimental pain; brain MRI showing how hypnosis alleviates pain (11 min)
- **HR alles wissen 2015**
Hypnosis to counteract fear of the dentist: www.ardmediathek.de/tv/alles-wissen/Hypnose-gegen-Zahnarztphobie/hr-fernsehen/Video?documentId=29814680&bcastId=3416170
Dental treatment, brain MRI showing how hypnosis alleviates pain (6 min)
- **Radio: SWR 27.05.2015**
Hypnotherapy: trance induction to combat anxiety and pain: www.ardmediathek.de/radio/SWR2-Wissen/Hypnotherapie-Trance-als-Mittel-gegen-%C3%84/SWR2/Audio-Podcast?documentId=28528316&bcastId=220656
(27 min)

eBOX 2

The history of hypnosis and assessment of its efficacy before the advent of evidence-based medicine (EBM)

Owing to their unconventional approach, hypnosis techniques attracted the attention of both orthodox physicians and the general public at an early stage. The scientific basis of hypnotic procedures was investigated as early as the 18th century.

The theory and techniques of “animal magnetism,” put forward by the Viennese physician Franz Anton Mesmer, are viewed as the precursor of modern hypnosis. Mesmer failed in his attempt to have animal magnetism accredited by the *Académie des Sciences* in Paris in 1784 (e5). The scientific committee appointed by King Louis XVI refuted the theory of magnetism and attributed Mesmer’s successful treatments to psychological mechanisms, namely the “arousal of powers of imagination and of imitation” (e6). The concept of magnetism persisted, however, and came to be adopted by a number of physicians. The English surgeon James Esdaile (1808–1859), working in India, carried out 345 major operations (amputations of arm, leg, breast, and penis, as well as excision of tumors) using the technique of “mesmerism” and recorded not only good analgesia but also low mortality (e7). The British physician John Elliotson (1791–1868) became professor at the University of London in 1831. Under pressure from the journal *Lancet*, which rejected his practice of animal magnetism, he resigned his post in 1838. From 1843 to 1856 he published a journal called *The Zoist*, dedicated exclusively to animal magnetism. However, this technique rapidly receded into the background with the introduction of ether and chloroform anesthesia in 1846/47 (e3).

The Scottish ophthalmologist Braid developed the theory of monoideism, whereby concentration on a single thought by means of optic fixation was held to lead to a neurologically conditioned state of sleep. This physiological explanation of hypnotic phenomena helped “hypnotism” attain recognition by physicians at a time when medicine was developing along scientific lines (e3). In 1891 the British Medical Association (BMA) commissioned a group of physicians to investigate hypnotism. After due appraisal the expert committee concluded that hypnotism was effective in the treatment of pain, sleep disorders, and functional symptoms. At its annual conference in 1892 the BMA unanimously recommended the therapeutic application of hypnosis (e8).

With the increasing importance of evidence-based medicine (EBM) in the 20th and 21st centuries, advocates and practitioners of clinical hypnosis came to see the necessity of controlled trials and synthesis of the findings in systematic reviews. The first German-language systematic review and meta-analysis of the efficacy of hypnosis was published in 2002 (e9). An expert report on evaluation of hypnotherapy as a psychotherapeutic technique according to the criteria of the German Scientific Advisory Committee on Psychotherapy (*Wissenschaftlicher Beirat Psychotherapie*) (§ 11, Psychotherapy Act) was produced in 2003 (e3). The Scientific Advisory Committee on Psychotherapy concluded that hypnotherapy can be considered a scientifically valid technique for the treatment, in adults, of mental and social factors in somatic diseases and of addiction and abuse (smoking cessation and methadone withdrawal) (ICD-10 F54, F10, F11) (e10).

eBOX 3

Discussion of the findings concerning the evidence of the efficacy of medical hypnosis

Three meta-analyses (10, 13, 14) of the use of hypnosis in medical interventions fulfilled our criterion of including at least 400 patients. If these meta-analyses were to be based largely on the same original studies, the evidence could be overestimated. Indeed, inspection revealed the following overlapping of the randomized controlled trials (RCTs) included: Kekecs et al. (10) and Tefikow et al. (14): N = 12; Kekecs et al. (10) and Schnur et al. (13): N = 8; Schnur et al. (13) and Tefikow et al. (14): N = 10. At least 50% of the RCTs in each of the three meta-analyses were also included in one or both of the others (Kekecs et al.: 16 of 26; Tefikow et al.: 18 of 34; Schnur et al.: 13 of 26). Nevertheless, each of the three covered an appreciable number of original studies that were not featured in the others. This can be explained by the variation in focus: Kekecs et al. (10) and Tefikow et al. (14) restricted themselves to studies on adults, while Schnur et al. (13) also included children. Whereas Schnur et al. (13) confined themselves to "emotional stress" as endpoint, Kekecs et al. (10) and Tefikow et al. (14) each calculated several effect sizes for several outcome variables, with Kekecs et al. (10) concentrating solely on postoperative endpoints. Therefore, since differentiated conclusions can certainly be drawn, we chose to present the results of all three meta-analyses of medical hypnosis in diagnostic, interventional, and surgical procedures.

Recommendations on the use of medical hypnosis in medical procedures are limited, however, by the poor methodological quality of many original studies. Moreover, on statistical criteria the effect strengths were mostly low. Blinding of the therapists and the patients is usually not possible (intervention bias) in RCTs with hypnosis (and other psychological techniques). In fact, at least in some studies in which audio files were used for hypnosis the medical personnel or diagnosticians were blinded, which is associated with conservative effect sizes (10, 14). Therefore, using the Cochrane Risk of Bias Tool the danger of bias is higher in RCTs that use psychological techniques than in RCTs where medications are administered. Two of the three systematic reviews of hypnosis in medical procedures point to low or uncertain quality of the existing RCTs and recommend that further studies with high-quality methodology should be carried out (10, 14). Because the original studies reported only average data and no response rates (e.g., the proportion of patients with only slight postoperative pain or no postoperative nausea), the meta-analyses could not calculate the number needed to treat for an additional benefit (NNTB). The clinical benefit of medical hypnosis in interventions is therefore difficult to estimate.

The quality of the data is better for irritable bowel syndrome: the risk of bias was low in most of the studies included (12). Response rates with a clinically meaningful benefit (NNT 5 and 3 respectively) were computed for adequate symptom reduction at the end of treatment and at 6-month follow-up. With regard to these NNTs, it should be remembered that most of the RCTs included patients who had shown insufficient reduction of symptoms in response to an established regimen of medication (12).

eTABLE 1

List of excluded systematic reviews with meta-analysis*

Reference	Medical indication (target group)	Number of RCTs/patients	Reason(s) for exclusion
Adachi et al. 2014 (e11)	Chronic pain (adults)	6/237 (+ 6 controlled trials/432)	Non-randomized trials were included
Bernardy et al. 2011 (e12)	Fibromyalgia syndrome (adults)	5/191	N <400
Birnie et al. 2014 (e13)	Pain and stress from injections (children and adolescents)	7/222	N <400
Bowker et al. 2014 (e14)	Pain in physically disabling diseases (adults)	6/237 (+ 4 non-randomized or only partly randomized trials)	N <400
Enck et al. 2010 (e15)	Irritable bowel syndrome (adults)	2/40	N <400; meta-analysis with >400 patients available (12)
Flammer et al. 2007 (e16)	Psychosomatic diseases (children and adults)	18/916	Not evaluated for each indication
Ford et al. 2014 (e17)	Irritable bowel syndrome (adults)	5/278	N <400; meta-analysis with >400 patients available (12)
Glazener et al. 2005 (e18)	Bed-wetting (children)	2/98	N <400; update of corresponding Cochrane group available (e19)
Huang et al. 2011 (e19)	Bed-wetting (children)	3/172	N <400
Köllner et al. 2012 (e20)	Fibromyalgia syndrome (adults)	4/102	N <400
Lee et al. 2014 (e21)	Irritable bowel syndrome (adults)	7/374	N <400; meta-analysis with >400 patients available (12)
Richardson et al. 2007 (e22)	Nausea and vomiting in chemotherapy for cancer (children and adults)	6/206	N <400
Smith et al. 2006 (e23)	Pain during labor and childbirth (adolescents and adults)	5/729	Update of corresponding Cochrane group available (11)
Zhang et al. 2015 (e24)	Temporomandibular disorder (adolescents and adults)	3/159	N <400

* In alphabetical order
RCTs, randomized controlled trials

eTABLE 2

Assessment of the methodological quality of the meta-analyses of controlled trials of medical hypnosis by means of AMSTAR (8)

Reference	Was an 'a priori' design provided?	Was there duplicate study selection and data extraction?	Was a comprehensive literature search performed?	Was the status of publication (i.e. grey literature) used as an inclusion criterion?	Was a list of studies (included and excluded) provided?	Were the characteristics of the included studies provided?	Was the scientific quality of the included studies assessed and documented?	Was the scientific quality of the included studies used appropriately in formulating conclusions?	Were the methods used to combine the findings of studies appropriate?	Was the likelihood of publication bias assessed?	Was the conflict of interest included?	Total
Kekecs et al. 2014 (10)	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	6
Madden et al. 2012 (11)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	10
Schäfer et al. 2014 (12)	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	8
Schnur et al. 2008 (13)	No	Yes	No	No	No	Yes	No	No	Yes	Yes	No	4
Tefikow et al. 2013 (14)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	8

*a priori design: protocol, internal review board approval, or research question previously published
AMSTAR, A Measurement Tool to Assess Systematic Reviews

eTABLE 3

Overview of randomized controlled trials on the effect of waking suggestions in medical treatment procedures*

Reference	Type of medical treatment	Type of suggestion Number of patients	Control intervention Number of patients	Result
Lang et al. 2000 (20)	Percutaneous vascular intervention	Structured attention control**; N = 80 Structured attention control plus self-relaxation and self-hypnosis; N = 82	Standard treatment; N = 79	Increase in pain: significantly greater for standard treatment (mean 0.09 pain score/15 min) and attention control (mean 0.04/15 min) than for hypnosis (no increase)
				Drug consumption: significantly higher increase in standard treatment group (mean 1.9 units) than in attention control group (mean 0.07) and hypnosis group (mean 0.11)
				Reduction of anxiety: no significant difference between attention control (mean -0.07) and hypnosis (mean -0.11); significantly lower with standard treatment (mean 0.04)
				Hemodynamic instability: significantly lower for hypnosis (1.2%) than for attention control (12.5%) and standard treatment (15.2%)
				Duration of intervention: significantly shorter for hypnosis (mean 61 min) and attention control (mean 67 min) than for standard treatment (mean 78 min)
Lang et al. 2006 (21)	Breast biopsy	Structured attention control**; N = 82 Structured attention control plus self-relaxation and self-hypnosis; N = 78	Standard treatment; N = 76	Increase in pain: significantly greater for standard treatment (mean 0.53) than for attention control (mean 0.37) and hypnosis (mean 0.34)
				Drug consumption: significantly higher increase in standard treatment group (mean 0.18) than in attention control group (mean -0.04) and hypnosis group (mean -0.27)
				Reduction of anxiety: significantly less reduction in standard treatment group (mean 0.18) than in attention control group (mean -0.04) and hypnosis group (mean -0.27)
				Complications: no significant differences among standard treatment (8.9%), attention control (13.8%), and hypnosis (3.7%)
				Duration of intervention: no significant differences among hypnosis (mean 39 min), attention control (mean 43 min), and standard treatment (mean 46 min)
Lang et al. 2008 (22)	Radiofrequency ablation or embolization of carcinomas	Structured attention control**; N = 65 Structured attention control plus self-relaxation and self-hypnosis; N = 66	Standard treatment; N = 70	Increase in pain: significantly greater for standard treatment (median 2.5 units) and attention control (median 2.5 units) than for hypnosis (median 0 units)
				Reduction of anxiety: no significant differences among standard treatment group (median 2 units), attention control group (median 2 units), and hypnosis group (median 1 unit)
				Complications: significantly higher rates in attention control group (48%) compared to hypnosis group (12%) and standard treatment group (26%)
				Duration of intervention: no significant differences among hypnosis (median 110 min), attention control (median 120 min), and standard treatment (median 110 min)
Ott et al. 2012 (23)	Sampling of venous blood	"I'm going to start taking the blood sample now" N = 50	"This will hurt a bit" N = 50	Mean pain intensity, as measured on an 11-point (0–10) numeric rating scale (NRS) was 2.7 in the "This will hurt" group compared with 1.6 in the "I'm going to" group (p = 0.001). 58 % of the probands in the "This will hurt" group but only two probands (4.2 %) in the "I'm going to" group rated the pain intensity of the injection at ≥ 1 on the NRS, the threshold value for mild to moderate pain (p < 0.001).
Oktay et al. 2014 (25)	Acute headache	"This drug is a powerful pain killer for your headache. Its analgesic effect peaks at about 20 to 30 minutes. We are expecting that your headache will resolve in 45 minutes" N = 50 (group 1)	"A nurse is going to administer you a pain killer called ... by intramuscular injection" N = 50 (group 2) "If your headache does not resolve in 45 minutes, we can administer you a more potent pain killer" N = 53 (group 3)	Pain reduction on a 0–100 visual analog scale 45 min after injection (p = 0.49): group 1: 43 ± 30 group 2: 39 ± 29 group 3: 36 ± 24

Reference	Type of medical treatment	Type of suggestion Number of patients	Control intervention Number of patients	Result
Varelmann et al. 2010 (24)	Local anesthesia before creation of access for peridural or spinal anesthesia in pregnant women before delivery	"We are now going to give you a local anesthetic so that it's comfortable for you when we perform the epidural spinal anesthesia" N = 33	"You will now feel a prick and a burning sensation in your back as though you have been stung by a bee; that's the worst part of the whole procedure" N = 32	Pain was rated significantly stronger by patients who received the second instruction (median pain intensity 5 versus 3 on an 11-point scale).

* Trials listed in alphabetical order

** Agreement with the patient's verbal and non-verbal communication patterns; attentive listening; reinforcement of feeling of autonomy ("Let us know at any time what we can do for you"); swift action in response to the patient's wishes; avoidance of negative suggestions ("How bad is your pain? "You will now feel a prick and a burning sensation"); positive suggestions (focus on sensations of fullness, coolness, warmth during painful stimuli)

Significant, p <0.05