The effectiveness of suggestive techniques as adjunct to medical procedures, and particularly applied in surgical settings

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1. Introduction

The present work is a compilation of three independent papers two of which are already published at international journals and one of them is currently under peer review.
In the dissertation I investigate the effects of suggestive techniques used in medical settings. This section gives a general picture about the aims and the rationale behind the papers and describes how they relate to each other.

1.1. Stress during medical procedures

The most common complaint of patients waiting for surgical procedures is anxiety (Jafar & Khan, 2009; Janis, 1958), even though all of these patients suffer from some kind of physical illness. In fact, anxiety affects somewhere between 60-90% of the population enlisted for surgery, and the prevalence in other medical procedures is high as well (Mackenzie, 1989; Norris & Baird, 1967; Perks, Chakravarti, & Manninen, 2009; Ramsay, 1972; Shevde & Panagopoulos, 1991). Due to this extraordinarily high incidence rate and its far stretching effects affecting both patients and the medical staff, procedure related stress is the prime target of psychological interventions applied in medicine. Because of its utmost importance and that there was no room in the papers for extended discussion of the topic, procedure related anxiety deserves its own section in the Introduction.
With a little exaggeration we can distill the dominant views on who should deal with the problem of procedural anxiety to tree main standpoints: “Patients should deal with it”, “The medical staff should deal with it” and “Psychologists should deal with it”. I’ll give an overview on procedural stress centered around these three standpoints.

1.1.1. “Patients should deal with it”

It is a common misconception that the effects of anxiety are isolated to the subjective (psychological) experiences of the patient, thus medical doctors – responsible for the body rather than the mind – have nothing to do with it. This couldn’t be further from the truth. In reality anxiety has various physiological and behavioral effects which are identifiable both before, during and after medical procedures. These effects directly impact the cost, required time and smoothness of surgical procedures.

For example studies consistently show a close association between anxiety and the level of pain reported by the patients, while a recent systematic review also points out that preoperative anxiety and catastrophization are closely associated with the development of chronic postsurgical pain (CPSP)(Theunissen, Peters, Bruce, Gramke, & Marcus, 2012). Anxious patients not only require more pain medication (Granot & Ferber, 2005; Munafò & Stevenson, 2001), but the amount of anesthetics needed to induce anesthesia also increase with the level of anxiety (Goldmann, Ogg, & Levey, 1988; Maranets & Kain, 1999; J. G. L. Williams & Jones, 1968). The physiological impact of stress around medical procedures also include cardiovascular changes like vasoconstriction (Gunnar Wallin, 1990; Thyer, Papsdorf, Davis, & Vallecorsa, 1984), elevated blood pressure and heart rate (Augustin & Hains, 1996; Shenefelt, 2010); anxiety also decreases rate of surgical wound healing and impairs other factors of recovery (Broadbent, Petrie, Alley, & Booth, 2003; George & Scott, 1982; J. K. Kiecolt-Glaser, Page, Marucha, MacCallum, & R., 1998; Vileikyte, 2007). All of these effects require extra attention and time from the medical staff, and behavioral symptoms like reduced cooperativeness and adherence hinder the effectiveness of medical procedures as well (DiMatteo, Lepper, & Croghan, 2000; Watson & Visram, 2003).

Judging from the high incidence rate of procedural anxiety, it is clear that currently most patients do not have the necessary tools to deal with the problem on their own, and based on the findings above, the implications of stress are unavoidable by the medical staff as well.

1.1.2. “The medical staff should deal with it”

Another view is that the medical staff should deal with patients’ anxiety, much like as pain management is their responsibility. Most doctors and nurses acknowledge the importance and benefits of anxiety management (e.g. (Frazier et al., 2003)). It is also clear that patients feel the need for more communication with the medical staff and that the relationship between the surgeon and the patient is a key factor in reducing perioperative stress (Betti, Sironi, Saino, Ricci, & Bonavina, 2011; Lim et al., 2011).

On the other hand, with the increase in the proportion of ambulatory surgical procedures (also known as outpatient surgery or daycase surgery) and the increasing popularity of elective surgeries, the contact time spent with one patient is gradually decreasing (Pritchard, 2009). The problem is escalated in countries like Hungary, where the the hospitals are severly understaffed. In a situation like this pharmacological anxiety management seems to be the most effective method, since anxiolytics are relatively cheap and can be administered coupled with the numerous other medications without requiring any extra time or attention. Indeed studies confirm that anxiety control is most often done by pharmacological means (e.g. (Frazier, et al., 2003)).

However for a number of reasons anxiety meds cannot provide a perfect and all around solution either. For example, anxiety medication has numerous side-effects. These unwanted effects cause problems especially in daycase surgery, where the patients discharged shortly after the operation and side-effects cannot be monitored and contained (Raybould & Bradshaw, 1987). In addition to the side-effects, the main effects of these drugs can also

interfere with other medication used around the operation, like the effects of drugs used for inducing and maintaining anesthesia. For patients who already use anxiolytics regularly, drug tolerance makes the calculation of the necessary doses for both anxiety management and anesthesia particularly problematic. We also have to consider that causes of perioperative anxiety are manifold, but anxiolytics are not selective in this regard.

With a different approach, some theorists want to raise attention on the negative impact of the medicalization of preparatory worry (Salmon, 1993). They argue that a moderate level of stress before invasive medical procedures may be even beneficial, making it easier for the patient to prepare for the treatment and the recovery. Although this theory is not overly supported in the literature, we must acknowledge that the pharmacological suppression of stress irrespective of the real psychological needs of the patient can hold its own downsides beside its benefits.

1.1.3. “Psychologists should deal with it”

A third viewpoint is that psychologists and psychotherapists should be responsible for the management of medical anxiety. It is true that psychologists are better equipped to detect and treat anxiety than either the patients or the medical staff.

There are two main approaches to the identification of perioperative anxiety. The first is simple detection. The most commonly used tools in this process is still the State component of the Spielberger State Trait Anyxiety Invetory (STAI)(Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1970), but there are questionnaires specifically designed to be used in a medical environment as well, like The Yale Preoperative Anxiety Scale (YPAS)(Kain et al., 1997) and The Amsterdam Preoperative Anxiety and Information Scale (APAIS)(Moerman, Van Dam, Muller, & Oosting, 1996).

The second approach is the identification of the vulnerable patients before they are exposed to the procedure itself and before the anxiety starts to build up. Studies show that higher trait anxiety, an active, vigilant coping style, internal locus of control, low self-control expectancy and low perceived social support are all good predictors of procedural anxiety (George & Scott, 1982; Kopp et al., 2003; Yilmaz, Sezer, Gürler, & Bekar, 2012). Demographic variables like female gender, younger age and higher educational status were also correlated positively with anxiety experienced before the operation while prior experience of surgery seems to be a protective factor (Jafar & Khan, 2009). This approach makes preventive anxiety management interventions and the targeting of the most exposed individuals possible.

There are several psychological interventions used to counteract the negative effects of perioperative anxiety. For example the effectiveness of psycho-educational preparation (Devine, 1992; Hathaway, 1986), hypnosis (Flory, Martinez Salazar, & Lang, 2007; Montgomery, David, Winkel, Silverstein, & Bovbjerg, 2002; Schnur, Kafer, Marcus, & Montgomery, 2008; Tefikow et al., 2013), guided imagery (Casida & Lemanski, 2010) and relaxation techniques (Johnston & Vögele, 1993) are all demonstrated to be effective in perioperative anxiety management by meta-analyses. In addition to controlling anxiety, psychological interventions also decreased pain intensity, pain medication intake, length of hospital stay, and costs, furthermore they improved recovery, physiological indices and satisfaction (see the results of above mentioned meta-analyses).

What is more, there are several other complementary and alternative therapies that are successfully applied to alleviate anxiety-related harms (Norred, 2000). These therapies include music (D. Evans, 2002), aromatherapy (Fayazi, Babashahi, & Rezaei, 2011), massage, (Moyer, Rounds, & Hannum, 2004) and meditation (Edwards, 1991), but there are also studies showing the beneficial effects of therapeutic touch, and Reiki (Petry, 2000).

Therapies specifically targeting children exist as well, like playful activities (Weber, 2010), video games, or clown doctors (Yip, Middleton, Cyna, & Carlyle, 2010).

All in all, psychologists seem to be the ones most equipped to identify and manage procedure related anxiety, but unfortunately there are nowhere near enough of them to attend to every surgical patient in need, with the current incidence rate.

1.1.4. Joint effort

In summary it seems that patients lack the tools to properly cope with procedural stress, doctors and nurses have only limited resources and the most commonly used of them – anxiolytic medication – is not ideal. Furthermore, while psychologists are better outfitted in this regard, they lack the numbers to have substantial impact. An ideal solution would be a joint effort to combat anxiety: with researchers identifying the most efficient methods, psychologist devising the interventions, the medical staff carrying them out and adherent patients who follow through with the therapies.

1.2. Concepts of suggestions and hypnosis

Therapeutic suggestion interventions would be outstanding tools for empowering the medical staff for anxiety management, because these techniques are easy to master and they can be used embedded into the communication with the patient, this way they do not take away precious time from the procedure itself. On the contrary, suggestions help to save time through decreasing the incidence of complications and increasing patient cooperativeness (Lang & Rosen, 2002). Positive suggestions can also be neatly fitted into other techniques like psycho-educational interventions. Suggestive techniques involving positive imagery and auto-

suggestions for relaxation, better outcomes, faster recovery etc. can be used to empower the patients as well.

All three papers presented in the dissertation evaluate the usefulness of suggestive interventions for medical procedures. Although hypnosis is one of the most prototypical suggestive techniques, and it is also the most commonly used one in somatic medicine, it is not the only one. This section will define the distinction between therapeutic suggestions and hypnosis and explain other related concepts which are necessary for the understanding of the later presented research and results.

According to Varga (2008), suggestions are elements of interpersonal communication which evoke automatic responses. These automatic reactions reflect and actualize the essential content or subject of the communication. One of the main characteristic of suggestions is that they evoke involuntary responses which are most often subtle and remain unnoticed, none the less they can elicit substantial psychological and physiological effects.

A simple example for the psychological effects of suggestions is demonstrated by the classical study of Loftus and Palmer (1974) in which subjects were first presented with films of car accidents, and later they had to tell how fast the cars were going on the films and whether they saw any broken glass near the crash site. The answers were highly influenced by the phrasing of the questions: if they heard the question “About how fast were the cars going when they smashed into each other?”, the speed estimated were higher and subjects were more inclined to say that they actually saw broken glass - even though none was present on the movies – compared to conditions when the question contained collided, bumped, contacted, or hit in place of smashed. Here the communicative act clearly influenced the recall of past events.

Of course, suggestions are not only capable of memory tricks. For example evidence suggests that suggestive techniques can reduce unpleasant sensations like pain (Castel, Pérez, Sala, Padrol, & Rull, 2007; McGlashan, Evans, & Orne, 1969), anxiety (Cruise, Chung, Yogendran, & Little, 1997; Spies, 1979), and nausea (Eberhart, Döring, Holzrichter, Roscher, & Seeling, 1998; Marchioro et al., 2000). They can also modulate immune responses and wound healing (Ginandes, Brooks, Sando, Jones, & Aker, 2003; Janice K Kiecolt-Glaser, Marucha, Atkinson, & Glaser, 2001). Physiological indices like blood pressure, heart rate, blood loss, body temperature (Deabler, Fidel, Dillenkoffer, & Elder, 1973; Enqvist, von Konow, & Bystedt, 1995), muscle strength and fatigue (Barber, 1966) and sport performance (Onestak, 1991; Pates, Cummings, & Maynard, 2002) are also affected by suggestions. (Effects of suggestions applied specifically in medical settings are detailed extensively in section 2.)

Hilgard (1973) states, that *hypnosis* - a state evoked by a set of protocols known as *hypnosis induction* - is a sub-domain of the broader field of suggestions. Many theorists argue that hypnosis elicits an altered state of consciousness, in which susceptibility to suggestions is increased (e.g. (Farthing, 1992)), although another prevailing theory rejects the ‘altered state approach’ and rather displays hypnosis as imaginative or social role enactment (Coe, Buckner, Howard, & Kobayashi, 1972; Lynn, Fassler, & Knox, 2005). The increased suggestibility is such a key feature of hypnosis that *hypnotizability* (a person’s ability to reach a specific depth of hypnosis (Weitzenhoffer, 1980)) is in most cases measured by the number of test suggestions the subject responded to during hypnosis. Good examples of the hypnotizability scales that use this methodology are the Stanford Hypnotic Susceptibility Scales (Weitzenhoffer & Hilgard, 1959; Weitzenhoffer & Hilgard, 1962); the Harvard group scale of hypnotic susceptibility (Shor & Orne, 1962); and the Waterloo Stanford Group Scale of Hypnotic Susceptibility (Bowers, 1993). Ironically these scales do not contain baseline

measure of the unhypnotized susceptibility to suggestions so they actually do not measure the enhancement of suggestibility, rather only the suggestibility after hypnosis. This contrast between the operational definitions of hypnosis and the measurement methods for hypnotizability led to a long lasting debate, for example summarized by Kirsch and colleges (Kirsch et al., 2011; Kirsch et al., 2008). Currently, evidence suggests that although hypnosis indeed elevates responsiveness to suggestions, this increase in suggestibility is unsubstantial (Kirsch, et al., 2011). Nevertheless, therapeutic hypnosis uses a large variety of suggestions in its toolkit, so it is still characterized as a suggestive method (Varga, 2008).

The phrase “therapeutic suggestions” also refer to interventions involving a complex set of suggestive techniques used with therapeutic purposes. However, these interventions do not contain formal hypnosis induction, on the contrary, they often rely on the assumption that people may spontaneously experience a trance state in unfamiliar situations, under extreme emotionally or physically demanding circumstances, and when they feel vulnerable and exposed, and that in this spontaneous altered state of consciousness the susceptibility for suggestions increase just like in a hypnotic state (Diószeghy, Varga, Fejes, & Pénzes, 2000). In several medical settings it is not unusual that more than one of these precursors of a spontaneous trance is present (Bejenke, 1996a, 1996b; Cheek, 1969; Varga, 2004). In the papers below the phrase therapeutic suggestions will also specifically refer to suggestive interventions which do not involve a formal induction of hypnosis. The techniques used in therapeutic suggestion interventions include but are not limited to the deliberate use of positive verbal or written suggestions; imagery exercises in different modalities (like the “safe place” imagery); relaxation techniques; and metaphors. Further information on the practical details of suggestive techniques and metaphors can be found in the following handbooks: (Hammond, 1990; Varga, 2011b).

1.3. Aims of the dissertation

Interestingly, although there are at least as many studies investigating the effects of therapeutic suggestions as of hypnosis around medical procedures, to this date there have been little attempt to review the areas of use, and to systematically evaluate the effectiveness of these interventions using meta-analytic techniques, while research on the effectiveness of practice-at-home autosuggestion techniques are also lacking. The aim of the dissertation is to address these issues.

The paper *"Positive suggestion techniques in somatic medicine: a review of the empirical studies"* gives an overview of the areas of application of therapeutic suggestion techniques in medicine by reviewing the clinical studies conducted in this field. The paper was first published in Hungarian in Orvosi Hetilap (Kekecs & Varga, 2011) and an updated version in English (presented here) is also published in Interventional Medicine and Applied Science (IMAS)(Kekecs & Varga, 2013). Orvosi Hetiap and IMAS are both journals targeting mainly medical doctors. Keeping in mind the areas of interest of the readers, our aim was to direct attention to the importance and effectiveness of positive suggestions in medicine in general by citing empirical data from as many different areas as possible and to help the reader understand what these therapeutic suggestions look like in practice by quoting from the suggestion scripts and protocols. This kind of wide scope review of the uses of (non-hypnosis) therapeutic suggestion techniques have not been done before.

Surgeries are conducted in well controlled environments with standard medical procedures and well defined outcomes, which allows for good control of confounding variables and good comparability between patients and studies as well. Because of these ideal characteristics and

based on the results of the first paper, the investigation of the usefulness of suggestive techniques was carried forward in the surgical theater. The second paper in the dissertation, *"Effects of patient education and therapeutic suggestions on cataract surgery patients: a randomized controlled clinical trial"* is accepted for publication in Patient Education and Counseling. With this study our goal was to investigate the effectiveness of a complex psycho-educational intervention based on suggestive techniques in the preparation for eye surgery. The novelty of the study lies in that positive suggestions are used in combination with patient education. This research is not only important because therapeutic suggestions have only rarely been used in ophthalmic settings before but also owing to its practice-at-home approach, which is getting increasingly important due to the raising proportion of outpatient surgical procedures.

Following from the experiences of the cataract surgery study, I became interested in some of the age-old debates in the literature of suggestions used in medicine. One of the reasons for the prolongation of these debates is the ambiguity in previous results. Because of the costs and complexities associated with clinical trials, studies often have a limited sample size, and as a result, there is a higher chance that in these medical settings smaller effects will not get detected with a high enough certainty, and thus they will be regarded as non-existent. To circumvent this problem we conducted a meta-analysis of the randomized controlled trials (RCTs) on the effectiveness of suggestions in controlling surgical side-effects featured in the third paper: *"The effectiveness of suggestive techniques in reducing post-operative side effects: a meta-analysis of randomized controlled trials"*. The aim of this paper was to tackle three long discussed questions in the literature about the methods of suggestion presentation: Is hypnotic induction necessary to deliver suggestions successfully in medical settings? Does live presentation of suggestions yield better results than recorded interventions? Do

suggestive techniques presented to conscious and unconscious (anesthetized) subjects have the same effectiveness? The manuscript of this paper is submitted to the Annals of Behavioral Medicine for peer review. There have been no previous attempts to systematically gather and analyze the studies using therapeutic suggestions before, which makes this meta-analysis unique.

The papers are presented in the chronological order which they were submitted in.
Table, figure and appendix numbering, citations and references are unified in the dissertation in order to improve readability and to avoid confusion. That is, the tables, figures and appendices are numbered consecutively and citations and references are presented according to the 6th edition of the Publication Manual of the American Psychological Association throughout the dissertation. The complete reference list can be found at the end of the dissertation.

2. Positive suggestion techniques in somatic medicine: a review of the empirical studies

Short title: Positive suggestion techniques in somatic medicine

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2.1. Abstract

Introduction: There is an ever reoccurring question in medical practice: does the positive attitude and communication of the medical staff make any difference?

Aim: Our aim is to present a comprehensive overview of the medically relevant effects of positive suggestions by reviewing the recent literature.

Methods: We will review the studies measuring the effects of suggestive communication of the past 20 years. In cases of studies presented in more detail we quote from the suggestion scripts used in the study too.

Results: Some of the reviewed papers report that positive suggestions lead to decreased pain and use of pain medication and positively affect physiological factors like bowel motility, blood pressure and bleeding during surgery as well. However the literature also contains studies in which only partial or no positive effects were found.

Conclusions: We emphasize further, more detailed investigation of positive suggestion techniques and its integration into the education of medical professionals.

Keywords: positive communication; positive suggestions; therapeutic suggestions; hypnosis; medical communication; controlled clinical studies

2.2. Introduction

This paper is an updated version of a previous one published in Hungarian in Orvosi Hetilap in the January 2011 issue (Kekecs & Varga, 2011) containing an extended list of the relevant studies.

The ability to use language makes our species unique. This ability made the emergence of culture possible which still seems to be a human-specific attribute, and which we like to think of as something that elevates us above other animals. Speech long since follows us on our evolutionary journey; since so long that substantial physiological apparatus is built around it, like the structures in the central nervous system responsible for communication or the vocal apparatus. It is apparent that words struck their roots in our bodies for a long while but we only recently started to understand how deep exactly these roots reach.

With our words we are capable of sending messages which have involuntary effects on the recipient. These messages are called suggestions.

Results start to crop up confirming that words that we use or hear affect physiological processes, thus healing processes as well. Therefore application of suggestions can be a new adjunct therapeutic tool which also enables us to adjust processes in the body. Because we speak to people during our medical practice we also use suggestions.

In the present paper we would like to highlight what goals can be achieved during medical communication if suggestive properties of words are used consciously. For this purpose empirical results on the effectiveness of therapeutic suggestions in medical practice will be summarized with emphasis on the different areas of application.

2.2.1. Attributes of suggestions, suggestions in medicine

We send and receive suggestions constantly during our everyday communication. Although suggestions usually manifest verbally, in some situations posture, vocal tone, or silence can also transfer suggestive content.

Everyone is susceptible to suggestions to some extent. Although it shows a variance among people it can be generally stated that specific situational characteristics and the state of mind of the person play a major role in the extent of this susceptibility. The literature defines three specific situations in which suggestibility (the level of responsiveness to suggestions) increases. These are: 1. altered states of consciousness; 2. fear, defenselessness, extensive emotional strain; 3. when we cannot rely on our usual frame of reference, because we are in such an unfamiliar situation (Diószeghy, et al., 2000; Varga, 1998).

For people in sickness often more than one of the above is true simultaneously especially in cases of patients in critical conditions (Cheek, 1969). That is why the situation of the patient and the doctor-patient interaction is of upmost importance for suggestive mechanics. Without being familiar with the nature of suggestive communication we might send negative suggestions to the patient with a statement or question that seems perfectly neutral to us, because a person in a negative trance state is disposed to negatively interpret an ambiguous or neutral comment, or to take a communication meant for others personally (Bejenke, 1996b; Varga, 1998).

Although patients are in similar situations resulting from their altered state of consciousness, it is important to state that the most effective communication can be achieved only if we are aware of their personal characteristics and needs, and that positive suggestions are also most efficient this way. (See for example the following studies (Disbrow, Bennett, & Owings, 1993; Lang et al., 2006)).

In the following we will present those controlled clinical empirical studies which examined the effectiveness of applying positive suggestions around medical procedures and somatic illnesses.

Our aim is to display a comprehensive image of the areas and methods of application of suggestive techniques by reviewing the research literature.

2.2.2. The focus of the review

We chose a narrow focus for the review so we can present the areas of application of suggestive communication for practitioners who work in somatic medicine with sufficient detail. Hereby we define the boundaries of our investigation:

- Only studies involving patients suffering from “somatic illnesses” will be included in the review, psychiatric or psychological problems are not in the scope of the present study. (Some of the somatization disorders will be mentioned in the papers, because these illnesses are still mostly treated by somatic medicine).
- Hypnosis is an efficient technique, which increases the susceptibility for suggestions using hypnotic induction, this way suggestions are especially effective if presented during a hypnotic trance state. Hypnosis is applied in numerous studies to “deliver” suggestions to patients with somatic illnesses, none the less we do not focus on these studies. We decided to exclude this area first of all because although hypnotic induction is very effective, there is often no time to use it or environmental settings are not appropriate for it in the everyday practice, and as we stated above practicality and easy accessibility is one of our main concerns. Also there are some excellent reviews which summarize studies using hypnosis in this area, see for example: (Lynn, Kirsch, Barabasz, Cardena, & Patterson, 2000; Pinnell & Covino, 2000). Furthermore a

certificate in using hypnotherapy is needed to utilize formal hypnosis, while a shorter training is enough for the application of therapeutic suggestions.

- Using placebo as an adjunct therapy can also be considered as a suggestion technique as the placebo effect can in a large part be attributed to the communication of the anticipated beneficial effects of the medication or therapy (Varga, 2006). We will not discuss studies involving placebo interventions in this review considering that it is a bit off of our main theme, which is positive suggestions used in the everyday medical communication. This does not mean that placebo would not be used commonly worldwide but the ethical consequences are still highly debated. Contemporary research results and ethical dilemmas of placebo as a therapeutic tool can be found here: (Benedetti, 2009; Köteles, Fodor, Cziboly, & Bárdos, 2007).
- Some relaxation methods can be considered to be suggestion techniques. Relaxation is a commonly used adjunct therapeutic method in medical practice, but during these techniques there are usually no specific suggestions for healing, rather suggestions are aimed to induce rest and calmness. That is why relaxation interventions in general will not be discussed. However, there are illnesses (for example fibromyalgia) in which muscle relaxation is an actual therapeutic goal because it is connected to the illnesses physiological background. Suggestion relaxation methods will only be discussed in these cases. Autogenic training is also a type of relaxation which utilizes suggestions. This technique will not be included in the present review because of its complex psychotherapeutic effects. About the therapeutic effectiveness of autogenic training see the following publications: (Aivazyan, Zaitsev, & Yurenev, 1988; Blanchard et al., 1988; Rucco, Feruglio, Genco, & Mosanghini, 1995; Stetter & Kupper, 2002).
- Positive suggestions are also used to ease labor. Although childbirth usually takes place in a medical setting, it is not considered a pathological state, so suggestions used

around labor do not fit the other studies originating from the "curing medicine" which we will discuss below. For further information on this field see the results of Mamdova, Zhakhmalova and Makashvili (2009).

- Finally, the review will only display controlled clinical studies. Case studies or laboratory research done with healthy subjects are not included in our current work.

In the following we will review the empirical research on the use of suggestion techniques in medicine. The studies are discussed from two angles: at first we will cover techniques frequently used around medical procedures; in the second part of the paper we will show which suggestion techniques proved to be useful taking specific illnesses as examples.

The list of empirical studies presented in the paper and the overview of their results can be found in tables 1. and 2 presented at the end of section 2.3.

2.3. Results

2.3.1. Positive suggestions used during medical procedures

2.3.1.1. Relieving procedural pain

In spite of their curing or diagnostic purposes some of the medical procedures can be unpleasant or outright painful for the patient. This kind of pain is referred to as procedural pain in the literature because they are evoked by medical interventions.

Patients are more cooperative and the general adherence is better if they do not experience pain during the procedure. In many cases pain can be prevented, reduced or relieved with the application of positive suggestive communication with the patient. Lang and Berbaum (1997) developed a training for radiology personnel during which the participants in the training learned the correct use of positive communication, suggestions, diversion and how to building rapport. They also acquired experience in using relaxation and self-hypnosis techniques.

During the study they interviewed 96 patients undergoing radiological procedures (radiological arteriography or percutaneous nephrostomy) about their pain experience. Half of the patients had the procedure before, the other half of them after the training of the radiology staff. The results of the study showed that after the training patients reported about half the amount of pain compared to patients who had their procedure before the training. Researchers also found a trend indicating that less pain medication was used after the training. Lang and colleges (2006) tested the effectiveness of a training based on similar suggestive techniques in a more recent study: 236 patients enlisted for large core needle breast biopsy were randomized to a standard treatment, an empathic treatment or a hypnosis group. The standard treatment group received only regular medical care. For our present purposes the empathic treatment group is the most interesting. In this group - aside from the usual hospital staff – a medical assistant trained in a standard behavioral pattern was also present during the procedure. This behavioral pattern included matching the patients verbal and nonverbal communication, attentive listening, increasing the patient's perception of control (for example: "let us know at any time what we can do for you"), rapid response to the needs of the patient, encouragement and the avoidance of negative communication, instead of which neutral phrases were used, like: instead of "you will feel a burn and a sting", "this is the local anesthetic".

Patient anxiety did not increase in the empathic treatment group during the intervention (contrary to the standard treatment group), and they reported less pain than the regular treatment control. Another important finding is that both the length and the total cost of the procedure was identical in the two groups in spite the fact that an additional professional was present in the case of the empathic treatment group (this can be attributed to the lower number of complications in the empathic treatment group). We should note here that in this study we

are not only talking about positive phrasing of sentences rather a technique largely customized to the needs of the patient.

We can also find similar encouraging results in the field of pediatric dentistry. Pretz and Bimstein (2000) applying a suggestive imagery technique asked the patients to select a favorite, calm place and later – during the injection – they helped them in imagining this place as vividly as possible. Thanks to this method the otherwise really unpleasant intervention got more bearable for the patients.

2.3.1.2. Suggestion techniques in surgery

One of the most extensively studied areas of suggestive techniques is their application in relieving surgical pain. A good example is the research of McLintock and colleges (1990b) in which they worked with 63 patients enlisted for elective hysterectomy. Patients were allocated into two groups. Participants in the intervention group listened to a tape under general anesthesia containing positive suggestions prepared specifically for this procedure. The script of the intervention contained for example the following suggestions: “Everything is going very well, we're very pleased with your progress"; "You feel warm and comfortable, calm, and relaxed"; "Any pain that you feel after the operation will not concern you." For the members of the control group a blank tape was played. The researchers report that women who heard the suggestions needed less morphine from the first hour after the operation compared to those who listened to the blank tape, and this difference only got larger in the first 24 hours after the procedure. 14,6 mg (22,4%) less morphine was used in the intervention group compared to the control.

Nilsson and colleges (2001) also report positive results using a similar study protocol. The group getting positive suggestions combined with music under general anesthesia needed in

average 26,6 mg less Ketobemidon after the operation. (The mean of pain medication used in the control group was 35,3 mg).

Other researchers confirmed the analgesic effects of positive suggestions as well (see also (Lambert, 1996)), but not only pain can be effectively treated with suggestive techniques.

The return of bowel motility can also be supported by this method: Disbrow, Bennett and Owings (1993) randomized 40 patients waiting for intestinal operations into two groups. They prepared a 5 minute recording for both groups which contained personalized elements, information about the surgery and postsurgical instructions. Te personalized content came from a previous interview (for example the mention of favorite food or the name of a family member). The recording of the suggestion group contained a script enhancing the restoration of bowel motility after surgery: “Because you need to eat food to bring nutrients to your body, it is important that your stomach and intestines begin to move as soon as possible after your operation. Abdominal operations cause your stomach and intestines to stop moving for a short time. In your case, this will be kept to a minimum because you will be very relaxed and comfortable. Your stomach will pump and gurgle, and you will become very hungry soon after the operation. Therefore, your stomach and intestines will begin to move and churn so that you can eat [favorite food from earlier in interview] soon after the operation.” (pp. 489). The researchers found that in the positive suggestion group bowel motility restored 1,6 days earlier.

Methodically correct controlled studies also demonstrate that by using suggestive techniques blood loss during surgery can be cut back by 30% (Enqvist, et al., 1995), that length of stay in the hospital can be reduced (Bonke, Schmitz, Verhage, & Zwaveling, 1986; Cowan Jr, Buffington, Cowan III, & Hathaway, 2001; Enqvist, et al., 1995; C. Evans & Richardson, 1988; Jelicic, Bonke, & Millar, 1993b), and that the occurrence of postoperative nausea, vomiting (Eberhart, et al., 1998; Jayaraman, Sharma, Sethi, Sood, & Kumra, 2006; Lebovits,

Twersky, & McEwan, 1999; A. R. Williams, Hind, Sweeney, & Fisher, 1994) headaches and muscle discomfort (Lebovits, et al., 1999) is lowered as well.

A study conducted by a Hungarian research group also confirmed the beneficial effects on the outcomes mentioned above. Jakubovits and colleges (1998; 2005) gave positive suggestions to the patients before and during the operation. They studied 51 women in their first project and found that those who got positive suggestions both before and during the operation reported less pain and required less analgesics, they had lower anxiety and felt generally better compared to the control group who only got regular treatment. 46 patients participated in their second study. Suggestion group patients had lower pain intensity on the day of the surgery and they needed 34% less pain medication in the first 6 postoperative days. There were also less postoperative complaints in this group and their appetite and bowel motility restored faster (75% of suggestion group patients were eating well already at the second postoperative day). In this study every patient received a unique suggestion protocol before the operation using the following guidelines: 1. minimizing fear of the unknown by providing information; 2. reducing anxiety by relaxation (for example using the calm place technique); 3. increasing the feeling of control in the patient by providing choice (for example they could chose which finger they wanted the pulse-oximeter to be clipped on); 4. increasing activity to enhance healing processes (for example providing instructions on the possible post-operative activities); 5. direct suggestions (for example: “your appetite will return soon after the procedure”).

Above we summarized which outcomes can be positively affected by the use of suggestive communication in surgical preparation, during surgery and around other types of unpleasant medical procedures.

Although there is substantial evidence supporting the effectiveness of suggestion techniques used around surgical procedures, there is also a number of publications which report no substantial effect. There was no difference in pain relief and analgesics used between the control and intervention groups in the following studies: (Blankfield, Zyzanski, Flocke, Alemagno, & Scheurman, 1995; Block, Ghoneim, Ping, & Ali, 1991; Boeke, Bonke, Bouwhuis-Hoogerwerf, Bovill, & Zwaveling, 1988; Bonke, et al., 1986; Dawson, Van Hamel, Wilkinson, Warwick, & O'Connor, 2001; Eberhart, et al., 1998; Lebovits, et al., 1999; Melzack, Germain, Bélanger, Fuchs, & Swick, 1996; van der Laan et al., 1996). Nilsson and colleges (2003) and Jayaraman and colleges (2006) did manage to show significant effect in pain related outcome measures compared to the regular treatment control group, but there was no difference in comparison to the group getting music as an active control condition. The following papers report null-results concerning outcomes of postoperative recovery (like length of stay in the hospital): (Blankfield, et al., 1995; Block, et al., 1991; Boeke, et al., 1988; Liu, Standen, & Aitkenhead, 1992). There are also studies in which nausea and vomiting was not significantly reduced compared to the control group (Block, et al., 1991; Boeke, et al., 1988; Bonke, et al., 1986; Dawson, et al., 2001; Nilsson, et al., 2003; Nilsson, et al., 2001).

2.3.2. Intensive care unit

Another group of Hungarian researchers assessed the effects of suggestions when utilized in the intensive care unit (ICU). Applying the method developed by Varga and colleges (2007), in the study of Szilágyi, Diószeghy, Benczúr and Varga (2007) patients in the intervention group got a positive suggestion intervention while the control group was treated regularly. Patients in the intervention group were visited by professionals (physicians or psychologists) trained in using Psychological Support Based On Positive Suggestions (PSBPS) a training

specifically focused on applying suggestive techniques in medical settings. These professionals talked to the patients every day for 20 minutes. This 20 minute long visit contained a semi-structured intervention: the caregivers had a number of pre-prepared scripts in their toolkit, but other than this every intervention was unique and personalized. One of the standard scripts goes like this: "*The most important thing has already happened: you are in a ward where everything is available for you to get the best treatment. In your case this means basically: (here we should state positively the aim of the treatment). Doctors, nurses and all these fantastic machines around you are just to help your body to regain the balance for its harmonious functioning.*" (Varga, et al., 2007). The intervention continued until the patient left the ICU.

The study revealed that patients in the intervention group required 2,5 days shorter mechanical ventilation and the length of stay in the ICU was reduced by 4 days compared to the control group. An interesting aspect of the results was that the intensive care units which participated in the study differed from each other in the efficiency of the suggestive intervention. The researchers point out that one of the characteristic differences between the two wards was that patients were treated by the same caregiver with PSBPS in more than 50% of the sessions in one of them, while persons performing the treatment alternated more often in the other ICU. Results show that beneficial effects of the suggestive intervention like shorter ventilation time and shorter length of stay were only pronounced in the group of patients who were treated by the same caregiver most of the time, while no beneficial effects were significant with patients who had alternating caregivers.

2.3.3. Suggestion techniques in treating specific illnesses

2.3.3.1. Chronic pain

Edelson and Fitzpatrick (Edelson & Fitzpatrick, 1989) studied 27 patients suffering from various chronic pain disorders. They evaluated the effectiveness of a type of cognitive behavioral therapy (CBT) for pain control. This method contained several positive suggestion elements, like it encouraged patients to avoid using the word “pain” during the expressing of their experiences, and to use imagery techniques to re-interpret these feelings as “numbness”. They were also taught to identify and positively reframe negative inner speech.

Significant increase in activity level (measured through 3 days after the last session) and decrease in pain intensity (measured at the end of the last session) was found in the CBT group. In this study hypnosis was also applied in one of the intervention groups. Although treatment with hypnosis also yielded improved pain ratings after the 4th session, interestingly it did not increase the activity level of patients like CBT alone. One of the reasons for this could be that patients might have attributed their improvements to hypnosis induction itself which is not that easily transferred to their daily routines as techniques learned during the cognitive therapy.

2.3.3.2. Fibromyalgia

Empirical studies confirm that positive suggestion techniques can be effectively used in the treatment of fibromyalgia.

Derbyshire, Whalley and Oakley (2009) included 13 highly hypnotizable fibromyalgia patients in their study, who learned an imagery technique. When so instructed, the subjects had to imagine their fibromyalgia pain on a dial then they “took control” of the dial, this way being able to increase or decrease their fibromyalgia pain at will. (This study also contained a hypnosis condition. In the hypnotic state, pain control was better using the above mentioned imagery.)

Castel and colleges (Castel, et al., 2007) evaluated 3 methods for decreasing fibromyalgia pain. The 45 participants were allocated to three groups: in the first one, patients got suggestions specifically to decrease their pain under hypnosis, in the second one the hypnotic suggestions involved relaxation and calmness instead of pain relief, and the third group got relaxation suggestions without hypnosis. The researchers found that all three interventions decreased fibromyalgia pain. Suggestions for pain relieve were the most efficient, and there was no difference in the pain scores between the two groups getting relaxation suggestions.

2.3.3.3. Somatization

Somatization disorders are common in the office of the general practitioner. These patients have symptoms that elicit significant suffering but physicians cannot find any physiological or organic cause for the symptoms. Thomas (1987) conducted a study involving 200 patients with symptoms but no abnormal physical signs and for whom no definite diagnosis could be made. The participants were randomly selected to attend one of four standardized consultations. They either received positive or negative consultation with or without treatment. The results showed that of patients who got positive consultation (in these groups *"the patient was given a firm diagnosis and told confidently that he would be better in a few days"* pp. 1200), 64% felt better in two weeks, conversely only 39% of those getting negative consultation (in which no firm assurance was given) reported getting better.

2.3.3.4. Warts

Based on their results Spanos, Stenstrom and Johnston (1988) concluded that positive suggestions facilitate the treatment of warts as well. Members of the intervention group received positive suggestions at two occasions, while the control group got no treatment. During the suggestion sessions patients were asked to *focus their attention inward* and they

were told that *the skin around the wart starts to tingle and to get warmer*. The dermatologist applying the intervention also informed the patients that *their wart will get smaller and smaller and it will fall off*. He asked the subjects to imagine vividly that their *wart starts to shrink and disappears*. Hypnosis induction preceded the suggestions in the first intervention group, relaxation in the second and in the third there were no adjunct methods, only the above mentioned suggestions. The intervention was most efficient in the latter (suggestions only) group. After the 6 week follow-up period one-third of the participants from this group lost at least one wart from their hand, while there was no spontaneous healing in the control group.

Talbe 1 Studies which found at least one beneficial effect of positive suggestion techniques.

Reference	Medical procedure	Suggestion intervention	Results
Bonke, B., Schmitz, P. I., Verhage, F., et al. (1986)	Gallbladder surgery	Suggestion tape during general anesthesia	A tendency showing that members of the suggestion group had a shorter hospital stay. Re-analysis of the data showed that for participants over 55 years of age the suggestion tape was a protective factor against prolonged hospital stay. (No difference in the amount of analgesics used after surgery, subjective pain intensity, subjective wellbeing, nausea, vomiting and quality of postoperative recovery.)
Castel, A., Perez, M., Sala, J., et al., (2012)	Fibromyalgia	Relaxation suggestions	Relaxation suggestions decreased subjective pain intensity by 43%. The sensory dimension of pain decreased by 27%, and the affective component by 53%.
Cowan, G. S. Jr; Buffington C. K.; Cowan, G. S; Hathaway, D. (2001)	Bariatric surgery	Suggestion tape during general anesthesia and in the recovery room	The suggestion group had better scores in the postoperative recovery regimen, they required less encouragement to perform specific tasks, and were discharged 1,6 days earlier from the hospital than the controls.

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Cruise, C. J., Chung, F., Yogendran, S., Little, D. (1997)	Cataract surgery	Relaxing suggestions played during the operation	State anxiety decreased compared to presurgery baseline in the suggestion group, they felt more relaxed than groups getting white noise and operating room noise (but these were also true for the relaxing music group). (There was no beneficial effect on any of the registered physiological measures, and the reported nervousness of the patients.)
Derbyshire, S. W., Whalley, M. G.Oakley, D. A. (2009)	Fibromyalgia	Guided imagery	Imagery suggestions were successful in controlling pain intensity.
Disbrow, E. A., Bennett, H. L.Owings, J. T. (1993)	Major intraperitoneal surgery	Tape containing 5 minutes suggestion intervention targeting postoperative bowel motility	Bowel function restored 1,6 days earlier and a trend was uncovered showing that the first fluid intake also came 1,5 days earlier in the suggestion group. (There was no difference in the time to the removal of the nasogastric tube and the length of hospital stay.)

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Eberhart, L. H.; Döring, H. J.; Holzrichter, P.; Roscher, R.; Seeling, W. (1998)	Thyroidectomy	Suggestion tape during general anesthesia	Patients in the suggestion group experienced less postoperative nausea and vomiting, required less anti-emetic treatment. (There was no difference in analgesic drug consumption.)
Edelson, J.Fitzpatrick, J. L. (1989)	Various chronic pain disorders	Cognitive behavioral therapy applying positive suggestions	Thanks to the intervention, pain intensity decreased, and the amount of active hours (standing, walking) increased contrary to the time spent passively (sitting), which decreased. (There was no difference in the time spent lying down and the assessment of pain.)
Enqvist, B., von Konow, L.Bystedt, H (1995)	Maxillofacial surgery	Taped suggestions played during surgery	Lower blood pressure, shorter period of pyrexia, and a trend for less blood loss was reported in the suggestion group who also received hypnotherapy before the surgery. The group who only received the taped suggestions during the operation experienced faster recovery, lower blood pressure and a trend for lower heart rate as well compared to the control group. (There was no difference in postoperative analgesic and anxiolytic drug requirement between the groups.)

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Evans, C.Richardson, P. H. (1988)	Hysterectomy	Taped suggestions during general anesthesia	The study showed 1,3 days (16%) shorter postoperative hospital stay, 22 hours (45%) shorter pyrexia, and better than expected recovery in the suggestion group compared to the control. (No difference in the amount of postoperative analgesics used, the level of pain unpleasantness (on the 5th postoperative day), time required for mobilization, urinary problems, incidence of nausea and vomiting and in mood and anxiety scores.)
Jakubovits, E., Janecskó, M., Varga, K., et al., (2005)	Gynecological surgery with general anesthesia	Suggestions before and during surgery	Lower pain scores on the day of surgery, 34% lower pain medication requirement on the first six days after the operation, and quicker recovery 5 hours, 4 days and 5 days postoperatively was reported in the suggestion group. Appetite and bowel motility also returned sooner in this group.

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Jakubovits, E., Janecskó, M.,Varga, K. (1998)	Gynecological surgery with general anesthesia	Suggestions before and during surgery	Reduced anxiety and pain, and better wellbeing was recorded while medication requirement also decreased. (No positive effect was found on subjective and objective outcomes of recovery (wound healing, complications, length of hospital stay, healing quality judged by doctors, nurses and patients); other physiological factors (bowel motility, urinary problems, body temperature); and on the following variables: headache, dizziness, appetite, mobility, wakefulness.)
Jayaraman, L., Sharma, S., Sethi, N., et al. (2006)	Operation with general anesthesia	Taped suggestions combined with music or only music during general anesthesia.	Less pain and fatigue, and better subjective wellbeing was observed in the suggestion group compared to the regular treatment control, but no difference was found in comparison with the music only group.
Jelicic, M., Bonke, B.Millar, K. (1993)	Hysterectomy	Suggestion tape during general anesthesia	Members of one of the suggestion groups spent less time in the hospital after surgery. (No difference in subjective wellbeing in any of the suggestion groups compared to the control and in the length of hospital stay in the other two suggestion groups.)

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Lambert, S. A. (1996)	Surgery with general anesthesia	Guided imagery training for the participants (children)	The length of post-surgical hospital stay was shorter by 19 hours (14%) in the suggestion group and they experienced 11% less pain on the days after the operation. (No difference in analgesic medication requirement, length of the procedure, length of anesthesia, length of stay in the post-anesthesia care unit (PACU) and in the level of postoperative anxiety.)
Lang, E. V., Berbaum, K. S. (1997)	Radiological procedures (arteriography or percutaneous nephrostomy)	Training in suggestive communication for the medical team	42% lower subjective pain intensity reported in the suggestion group compared to the control; trend showing 24% less analgesic requirement in the suggestion group.
Lang, E. V., Berbaum, K. S., Faintuch, S., et al. (2006)	Large core needle breast biopsy	Training in suggestive communication for the medical team	Anxiety did not increase in the suggestion group while it increased in the control group. Smaller increase in the pain intensity scores in the suggestion group compared to the control.

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Lebovits, A. H., Twersky, R.McEwan, B. (1999)	Hernia repair	Suggestion tape during general anesthesia	Suggestion group patients experienced less nausea and vomiting in the first 90 minutes after surgery compared to control patients (there was no difference in the rest of the day). Incidence of headaches and muscle discomfort also decreased. (Pain intensity and analgesic medication requirement was the same in the two groups.)
McLintock, T. T., Aitken, H., Downie, C. F., et al. (1990)	Hysterectomy	Taped suggestions during general anesthesia	Patients in the suggestion group consumed 14,6 mg (22,4%) less morphine compared to the control on the first day after surgery.
Nilsson, U., Rawal, N., Unestahl, L. E., et al. (2001)	Hysterectomy	Tape containing suggestions combined with music played during surgery	8,7mg (25%) less analgesic medication (Ketobemidon) was used on the day of surgery in comparison with the control group. (A No difference in the 1st, 2nd and 3rd postoperative days.) Lower fatigue scores at the end of hospital stay (no difference on the day of the surgery and one day after the operation). (There was no difference between the groups in mobilization, nausea and vomiting, bowel functions, subjective wellbeing and length of hospital stay.)

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Peretz, B.Bimstein, E. (2000)	Pediatric dental procedures	Favorite place imagery, positive suggestions during local anesthesia	The procedure was more tolerable for the children.
Spanos, N. P., Stenstrom, R. J.Johnston, J. C., (1988)	Wart therapy	Positive suggestion intervention on two occasions	The incidence of spontaneous wart remission was higher in the suggestion group compared to the control.
Szilágyi, Á., Diószeghy, C., Benczúr, L., et al., (2007)	Intensive care unit, mechanically ventilated patients	20 minutes of psychological support involving suggestions daily	The time of mechanical ventilation was 2,5 days shorter in the group getting suggestion intervention and in one of the two participating hospitals length of stay in the ICU was also reduced by 4 days. (Length of stay did not differ among the groups in the other hospital.)
Thomas, K. B., (1987)	General practitioner consultation, somatization disorders	Consultation involving positive suggestions	64% of patients in the group getting positive consultation got better one week later, significantly more, than in the negative consultation group in which only 39% reported the same.

Table 1. continued

Reference	Medical procedure	Suggestion intervention	Results
Williams, A. R., Hind, M., Sweeney, B. P., et al. (1994)	Mayor gynecological surgery	Suggestion tape during general anesthesia	24 hours after surgery the incidence of vomiting was 32% in the suggestion group while it was 69% in the control group . The severity of vomiting was lower too, and suggestion group patients needed in average 7mg (36%) less Metoclopromide. (No difference was found between the groups in blood loss, fluid intake, postoperative analgesic requirements and length of anesthesia.)

Table 2. Studies which found no evidence of the beneficial effects of positive suggestions

Reference	Medical procedure	Suggestion intervention	Results
Block, R. I., Ghoneim, M. M., Sum Ping, S. T. et al. (1991)	Various abdominal surgeries	Suggestion tape during general anesthesia	No difference was found between the suggestion and control groups in the frequency of consumption and the dosage of postoperative analgesic and antiemetic drugs; in pyrexia, nauseam and vomiting; in the incidence of other gastrointestinal or urinary complaints; in the levels of pain, anxiety, physiological or psychological recovery; and in the length of hospital stay after the operation.
Dawson, P., Van Hamel, C., Wilkinson, D. et al. (2001)	Hysterectomy	Suggestion tape during general anesthesia	No difference between the groups in analgesic and antiemetic drug requirement; and in the level of pain, and nausea.
Melzack, R., Germain, M., Belanger, E. et al. (1996)	Gallbladder surgery or hysterectomy	Suggestion tape during general anesthesia	The suggestion and control groups did not differ in their reported pain intensity in the first four postoperative days, and contrary to the expectations control group patients spent in average 17 hours less in the hospital than the suggestion group ($p<0,05$).
Blankfield, R. P., Zyzanski, S. J., Flocke, S. A. et al. (1995)	Coronary artery bypass surgery	Suggestion tape during general anesthesia and after surgery	Time spent in the Post-anesthesia care unit (PACU) and in the hospital, the amount of analgesics used, anxiety, depression and recovery scores, daily activity and cardiovascular problems were the same in the control and the suggestion group. None the less half of the patients in the suggestion group claimed that the intervention tape helped them in some way.

Table 2. continued

Reference	Medical procedure	Suggestion intervention	Results
van der Laan, W. H., van Leeuwen, B. L., Sebel, P. S. et al. (1996)	Hysterectomy, myomectomy, or gynecologic laparotomy	Suggestion intervention before and after surgery	The groups did not show difference in postoperative morphine consumption, pain intensity, length of hospital stay, and nausea and anxiety scores.
Liu, W. H., Standen, P. J.Aitkenhead, A. R. (1992)	Hysterectomy	Suggestion tape during general anesthesia	No difference was reported between the groups in the length of postoperative pyrexia, subjective pain intensity, the amount of analgesics used, the number of nausea episodes, flatulence, mobility, wound or other complications and length of hospital stay.
Boeke, S., Bonke, B., Bouwhuis-Hoogerwerf, M. L. et al. (1988)	Gallbladder surgery	Suggestion tape during general anesthesia	The suggestion and control groups did not differ in subjective pain intensity, length of hospital stay, level of nausea, subjective wellbeing and in the level of recovery assessed by the medical staff.

2.4. Discussion

There are a large number of controlled clinical studies aiming to evaluate the effectiveness of positive suggestion techniques used adjunctively in the treatment of somatic illnesses.

These methods - because they mostly apply the tools of everyday communication – are easily learned and can be utilized in day to day medical practice without additional costs.

That trained and conscious use of positive suggestions is not yet wide spread in medicine can in part be explained by the fact that clinical significance of positive communication was only started to be uncovered in the last decades.

There are encouraging results coming from multiple areas of medicine already. We could see that in many occasions suggestion techniques used as adjunct to medical procedures led to a faster and more efficient healing process, furthermore they contributed to the reduction of pain and the unpleasant side-effects of medical procedures, but the results are still ambiguous.

Our picture of this topic is far from being complete. First of all most of the studies still originate from surgery. It would be necessary to replicate the results of studies conducted in non-surgical settings and to perform studies with the goal of uncovering the underlying mechanisms of the effects.

We have listed several studies which did not support the hypothesis that suggestions have a significant positive effect in the perioperative period, but in other medical settings we could only find studies reporting positive results. This could be an indication of publication bias (meaning that studies reporting null-results or negative results did not get published). On the other hand this also poses a scientifically relevant problem: Which of the suggestion techniques yield the positive results and which characteristics reduced the effectiveness in other studies? We encourage the publication of detailed suggestion scripts and protocols, as a scientifically correct analysis and comparison would only be possible this way.

Based on the reported protocols and results of the reviewed papers it seems that personalization of suggestive therapy can be a key factor in efficiency. Techniques in which suggestions were delivered in person, thus allowing a caregiver to emphatically adapt the technique to the patients' needs; suggestion scripts containing personally relevant content; and studies in which patients were awake during the psychological intervention seem to be more effective than protocols which gave no room for personalization (patients under general anesthesia, recorded intervention, no content related to the person).

One of the basic goals during a scientific investigation is usually the strict control of as many confounding variables as possible, so it may seem a good idea to standardize the suggestion script or to record it so every person gets the same intervention. Although we are fully aware that control and comparability in research makes standardization of the intervention necessary, in light of our review researchers also have to take into consideration that there might be a tradeoff between methodological quality (standardization) and effectiveness (personalization).

Our conclusion also holds true for clinical application. In this case simple positive rephrasing of our message is only the first step. As stated above suggestive communication reaches its maximal potential if both the specific needs of the patient is considered and the rules of designing positive suggestions are applied (Varga & Diószeghy, 2004a, 2004b). (Good examples can be found here: (Varga, 2005; Varga & Diószeghy, 2001).)

Although our review primarily focused on verbally transmitted positive suggestions (because of the predominance of these kinds of studies) we have to remember that not all suggestions are verbal. The hospital environment, the communication setting, and of course nonverbal communication also carry suggestions so in practice these have to be accounted for as well.

We believe that professional use of positive communication is of outmost importance as all medical communication is suggestive. If we utilize this consciously we can enhance healing and the comfort of the patients. As demonstrated in several of the above described studies these skills and techniques can be learned. In Hungary medical communication is the part of the education of doctors and since the last years the curriculum contains suggestive techniques too (Varga & Diószeghy, 2004b). Aside from this there is also a training in the use of suggestions specifically for medical employees. The training was started in 2001 and since then until 2012 almost 200 professionals graduated. It would be beneficial both for medical professionals and for patients if trainings in this field would get even more emphasis.

In summary, suggestive communication is another – still underutilized – tool in our arsenal which has the potential to significantly affect the everyday practice and effectiveness of modern medicine. To harness this tool to the fullest a lot of work still needs to be done by researchers, by the practicing doctors and nurses and by people involved in their education and training.

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3. Effects of patient education and therapeutic suggestions on cataract surgery patients: a randomized controlled clinical trial

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3.1. Abstract

Objective: This paper describes a randomized controlled single blind study testing the effects of a patient education intervention combined with positive therapeutic suggestions on anxiety for cataract surgery patients.

Methods: 84 patients participated in the study. Physiological and behavioral indicators of anxiety were compared between a regularly treated control and an intervention group receiving an audio CD containing information, relaxation, and positive imagery.

Results: We found that the intervention group was calmer throughout the four measurement points of the study (p = .004; d = 0.71) and they were more cooperative (p = .01; d = 0.60) during the operation. The groups did not differ in sleep quality before the day of the operation, heart rate during the procedure, and subjective well-being.

Conclusion: Findings indicate that preoperative information combined with positive suggestions and anxiety management techniques might reduce patient anxiety in the perioperative period of cataract surgery, but further research is needed to investigate the benefits of such interventions and to uncover the underlying mechanisms.

Practice Implications: Patient education interventions providing additional anxiety management techniques are recommended for use prior to cataract surgery.

Keywords: ophthalmic surgery; anxiety; patient education; therapeutic suggestions; relaxation; guided imagery

3.2. Introduction

Anxiety is the most common negative affect associated with surgery as well as a reliable predictor of postoperative mood and pain sensation (Granot & Ferber, 2005; Munafò & Stevenson, 2001). Former studies confirmed that cataract surgery patients often experience fear and anxiety (Fagerström, 1993; Foggitt, 2001; Marback, Temporini, & Júnior, 2007) not only during but also before and after the operation, and during post-operative visits (Nijkamp et al., 2004; Nijkamp et al., 2002). The consequences of high perioparative anxiety range from increased pain sensitivity (Granot & Ferber, 2005), blood pressure and heart rate (Augustin & Hains, 1996), medication requirement (Maranets & Kain, 1999), and reduced compliance during the procedure (Watson & Visram, 2003). In addition, researchers found elevated intraocular pressure as a result of stress (Brody, Erb, Veit, & Rau, 1999; Miyazaki, Matsuo, & Kurabayashi, 2000).

To decrease perioperative distress and to overcome its negative side-effects the use of psycho-educational intervention is advised in the literature (Breemhaar, Van den Borne, & Mullen, 1996; Mark, 2003). So far only a handful of studies evaluated the effectiveness of such interventions for cataract surgery, even though it is one of the most common elective surgical procedures worldwide (Taylor, 2000). Researchers reported that providing information on the procedure , on the experience of undergoing surgery and on the potential risks decreased anxiety immediately after the operation (Pager, 2005) and one month after the procedure (Ramos, de Matos, Branquinho, & Pereira, 2011).

Another approach for mitigating anxiety during medical procedures is the use of positive verbal suggestions (Kekecs, 2011; Kekecs & Varga, 2011; Kekecs & Varga, 2013) Suggestions are messages in an interpersonal communication which evoke automatic psychological, behavioral or emotional responses in the receiver (Varga, 2011a) They most likely assert their effects through priming mechanisms. Although suggestions are one of the

most important tools of hypnosis, suggestive techniques can be successfully used without formal hypnosis induction as well (Kekecs & Varga, 2013). Studies support that suggestions have beneficial impact on various surgical outcomes (Montgomery, et al., 2002; Wobst, 2007) and specifically on mitigating procedural anxiety (e.g. (Holden-lund, 1988; Lang et al., 2000; Schupp, Berbaum, Berbaum, & Lang, 2005) .

The effectiveness of positive suggestions has been already investigated in ophthalmic surgery. One of the studies found that an intervention just before radial keratotomy increased the subjective Well-being of patients the day after surgery, but did not decrease unnecessary movements during operation and pain experience (John & Parrino, 1983) Another report showed that relaxing suggestions played during cataract surgery improved patient and surgeon satisfaction and patients' level of relaxation while they did not show beneficial effect on cardiovascular measures and respiration rate (Cruise, et al., 1997).

So far no studies evaluated the effectiveness of a combination of preoperative information and positive suggestions in cataract surgery. Furthermore former studies usually looked at a small number of measurement points thus only providing information on a subset of the previously identified stages of perioperative distress (Nijkamp, et al., 2002).

The aim of our present study was to investigate the effectiveness of a preoperative psycho-educational intervention containing both information and positive verbal suggestions on reducing perioperative anxiety while measuring outcomes from pre- during and post-surgery as well as from the first postoperative visit.

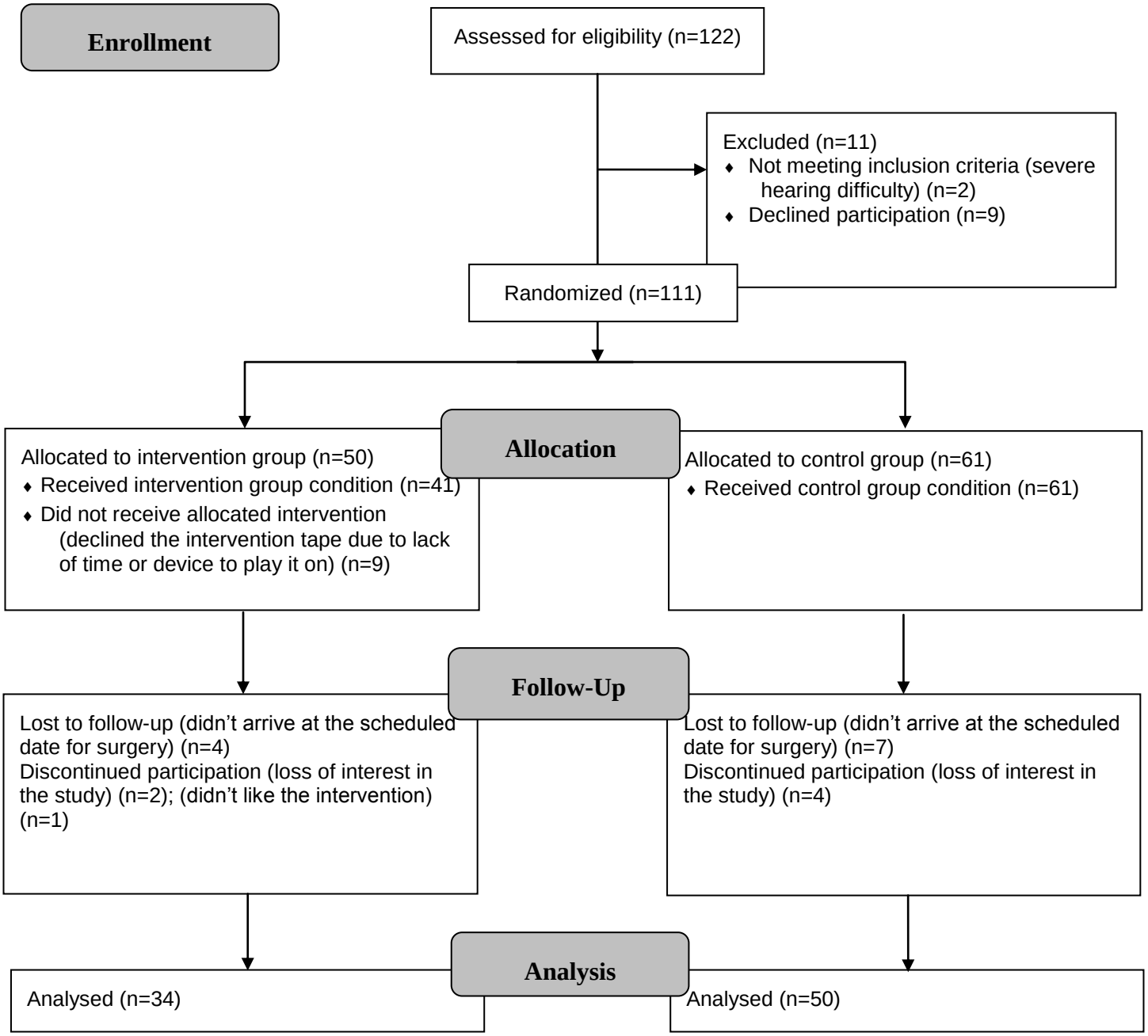
3.3. Method

3.3.1. Participants

Based on the data retrieved from the study of Holden-lund (1988) the a priori calculation in G*Power 3.1.3 (Faul, Erdfelder, Lang, & Buchner, 2007) determined that a minimum total sample size of 34 would be needed in a repeated measures between subjects design to show a significant difference in postoperative anxiety (d = -0.98; α = 0.01; $1\text{-}\beta$ = .80*; number of measurements* = 4*; correlation among repeated measures* = .50*)*.

The study was carried out between 1st Febuary 2011 and 27th November 2011. We recruited participants from patients enlisted for cataract surgery at the Europmed Orvosi Szolgáltató Kft's Healthcare Center in Budaörs, Hungary. Patients (a) above the age of 17; (b) who could understand Hungarian; (c) who had no prior cataract surgery; and (d) ones with no hearing disability were eligible. Patients with a prior cataract surgery were excluded to avoid heterogeneity in anxiety resulting from the familiarity of the procedure (Jafar & Khan, 2009; Matthias & Samarasekera, 2012). Of the 122 patients who were assessed for eligibility, 111 were randomized and 84 completed the study (30 male and 54 female). (For further details refer to Fig. 1). All but one of the participants (Arabic) were Caucasian, age ranging from 28 to 92 years (M = 69.17; SD = 11.30).

Fig. 1 CONSORT Flow Diagram



3.3.2. Procedure

The study was conducted according to the Helsinki Declaration of 1975, as revised in 2000, and has been approved by the Hungarian Medical Science Association's Science and Research Ethics Committee (permit reference number: 6327-0/2011-EKU (200/PI/11.) with attachment: 20391-0/2010-1018EKU (824/PI/10.)). All participants provided signed informed consent.

The recording of baseline characteristics was followed by group allocation. A research assistant randomly assigned participants to a control or an intervention group using 20 non-transparent cards labeled 'control group' or 'intervention group' which were re-shuffled for every participant. To assure blindness of the study team and the hospital staff the assistant was only responsible for group allocation and was not involved in further stages of the study, furthermore patients were instructed not to inform anyone as to which condition they had been assigned to. Subsequently, the intervention group listened to the intervention from a CD player through headphones and received a copy for home use, while control group patients received the regular clinical treatment and did not participate in psychological preparation. The assistant instructed intervention group participants to listen to the recording four times before the surgery to ensure some practice in the relaxation and imagery techniques. They were also told that the last time they should listen to the tape was on the night before the operation.

The intervention script was developed by the eye surgeon who conducted the operations (K. G., fourth author) and a hypnotherapist experienced in using positive suggestions in medical contexts (E. J., second author). The recording was 15min 27sec in length and was read out by K. G. The script provided information on the phases of the operation and the recovery period, while using positive suggestions and introducing relaxation and imagery techniques. For example the CD encouraged patients to focus their attention on

controlling their breathing and to imagine a safe place during the operation. Some examples from the script: ‘When you arrive in the forefront of the operating room you’ll get a number of eye drops (…) It’ll be good to know that with every drop your pupil will get more dilated and dilated and your eye will get more and more anesthetized as long as it’s needed.’; ‘First your eye will be cleaned with a disinfectant solution (…) Some imagine this like a pleasant cool breeze that washes away not only bacteria but the remaining tension as well.’

In the perioperative room after the initial medical examination, patients got one Xanax pill (0.25mg of Alprazolam – as an anxiolytic, a standard procedure in the healthcare centre). Patients spent approximately 30 minutes in the perioperative room.[2] To control as many confounding factors as possible, only one surgeon performed all the operations (K. G., fourth author) in the same operating room (OR) with the same surgical staff. After the operation, patients returned to the perioperative room where they rested with their eyes closed for 20 minutes, and were discharged shortly after a brief examination . The following day patients returned for a postoperative visit where the intervention group patients were asked of the number of times they had listened to the recording at home. Most participants claimed to have listened to the recording four times (M = 4.21; SD = 2.16). Although two patients did not listen to the tape at home at all, they were still included in the intervention group as they had listened to the tape once at the medical centre.

3.3.3. Measures

The study included eight measurement points: 1. 'First meeting' (before group allocation); 2. 'Before surgery' (in the perioperative room after the initial medical examination

[2] The other medications used before the surgery was as follows: Oxybuprocain 4 mg/ml eye drop 3 times during the last 10 minutes before operation (an anaesthetic), Cyclopentolate hydrochloric 5mg/ml eye drop used 3 times in the last hour before the operation (a pupil dilator), levofloxacin 5 mg/ml eye drop used 5 times during the last 24 hours preceding the operation (an antibiotic). If the anaesthesiologist judged it necessary outside the operating theatre, 1-3 puffs of Cordaflex spray were used (sprayed under the tongue on the oral mucous membrane, active ingredient: Nifedipine, 5mg per puff). If high blood pressure occurred in the operating theatre Ebrantil was used intravenously (50 mg per dose, active ingredient: Urapidil).

and premedication); 3. ‘Surgery 1’ (at first incision); 4. ‘Surgery 2’ (at the start of Phacoemulsification, approximately 3 minutes into the surgery); 5. ‘Surgery 3’ (just before the patient left the operating table, approximately 7 minutes after first incision). 6. 'End of surgery' (immediately after the operation) 7. 'After surgery' (at the end of the 20min rest period). 8. 'Postoperative visit' (before medical examination at the postoperative visit).

3.3.3.1. Baseline characteristics

We recorded several baseline characteristics at the First meeting measurement point: To determine any differences in trait anxiety between the two groups we used the trait anxiety subscale of State Trait Anxiety Inventory (STAI, 20 items, Cronbach’s $\alpha = .88$)(Spielberger, et al., 1970). The Low Vision Quality of Life test (LVQoL) (Wolffsohn & Cochrane, 2000; Wolffsohn, Cochrane, & Watt, 2000) was also applied, which is a 25 item questionnaire (Cronbach’s $\alpha = .90$). A study assistant read out loud both of these tests for all participants individually, as most of them would have trouble reading because of their cataract. In addition, corrected visual acuity scores, age and gender were also recorded, and Well-being and Calmness were assessed (see 3.3.3.2.).

3.3.3.2. Main outcome measures

Heart rate and blood pressure - We monitored the heart rate (HR) using an OVA 1 automatic blood pressure monitor from Orvosi Műszerkereskedelmi Rt. in the perioperative room and an Infinity Delta monitor from Dräger Medical Inc in the OR at measurement points Before surgery; Surgery 1; Surgery 2; Surgery 3 and After surgery. Blood pressure was also considered as an outcome measure, but had to be excluded because of the strict antihypertensive regime involved with the operation.

Calmness and Cooperativeness - A study assistant herein referred to as the observer had to answer to the following question: ‘How would you rate the current state of mind of the

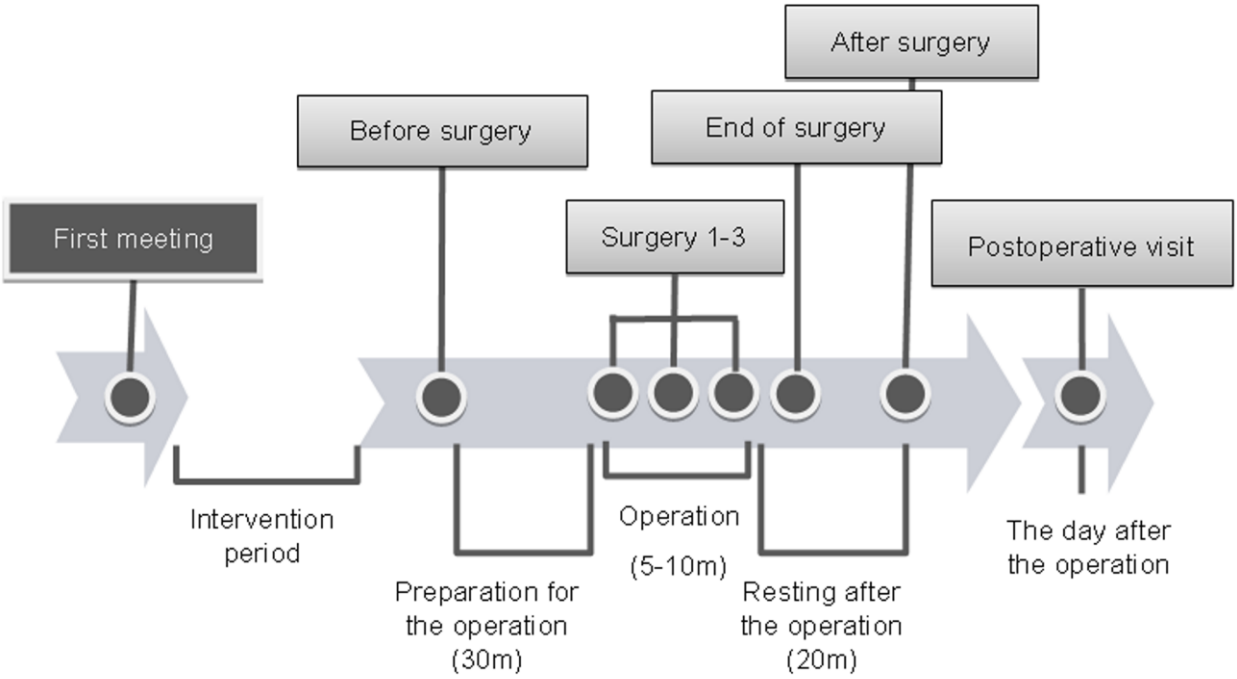
subject?' based on the behavior of the patient during the consultation with the surgeon, in the perioperative room before and after the operation and during the first postoperative visit. A 7-point Likert scale was used, ranging from '1: Really anxious' to '7: Totally calm'. Immediately after each operation the surgeon answered the following question: 'How would you rate the state of mind of the subject during the surgery?' using the same Likert scale and she also rated the cooperativeness of the patients during surgery in a similar manner at the end of the surgery.

Well-being - Subjective well-being was measured using the Pain Affect Faces Scale (McGrath, 1990). at the measurement points: First meeting, Before surgery, After surgery and Postoperative visit. The Faces Scale is a visual scale where a series of 9 schematic line drawn faces are presented to the patient. These faces show different levels of happiness or discomfort from which the patient chooses the one that best represents his current mood. The responses were coded on a 9 point scale, 1 meaning the worst, 9 the best Well-being. Drawings were enlarged so that all of the participants could see the faces and their expressions.

Sleep quality - According to the medical staff some of the patients experience sleeping difficulties on the night before surgery, therefore the observer asked the following question of the patient: 'Did you sleep well on the night before the operation?' This was measured before surgery, with the possible answers: yes or no.

See Fig. 2 for a summary of the measurement points and measures.

Fig. 2 Timing of the protocol and the measurement points



Note. Measures taken at the specific measurement points:

First meeting: STAI-T; LVQoL; Calmness as assessed by the observer; Well-being; Visual acuity; Demographics

Before surgery: Calmness as assessed by the observer; Well-being; Heart rate; Sleep quality;

Surgery 1, 2, 3: Heart rate

End of surgery: Calmness as assessed by the surgeon; Cooperativeness as assessed by the surgeon;

After surgery: Calmness as assessed by the observer; Well-being; Heart rate;

Postoperative visit: Calmness assessed by the observer; Well-being

(The artwork was created by MS PowerPoint.)

3.3.4. Data analysis

3.3.4.1. Analysis of baseline differences

To test for any initial group differences we used independent samples t-tests (age, STAI-trait, LVQoL, corrected visual acuity), Chi-square test (gender) and Mann-Whitney's U test (Calmness, Well-being).

3.3.4.2. Hypothesis testing

We used mixed ANOVAs to investigate group main effects on HR, Calmness and Well-being throughout all measurement points. Because women tend to have a higher HR (Stramba-Badiale, Locati, Martinelli, Courville, & Schwartz, 1997). the difference in gender distribution between groups was substantial (although not significant), we entered gender as covariate for the test of HR. The assumptions of the repeated measures ANCOVA were not violated for HR, however according to the Q-Q plots and Kolmogorov-Smirnov tests, error terms did not follow normal distribution for Well-being and Calmness. To counteract this problem we performed rank transformation on the problematic data and ran parametric mixed ANOVA as suggested by Beasley (Beasley, 2002). Furthermore we evaluated group differences using a Chi-square test for Sleep quality and Mann-Whitney U test for Cooperativeness as assessed by the surgeon. Critical values of significance were set to $p < .01$ using Bonferroni correction to account for multiple comparisons.

3.3.4.3. Post-hoc analyses

If significant group main effect was found in the mixed ANCOVAs, post-hoc analyses (ANCOVA or Mann-Whitney's U test) were performed on the measurement points separately to determine which of the measurement points were affected by the intervention. We also tested for the influence of the number of times subjects had listened to the recording on the outcome variables by using independent samples t-tests for sleep quality and Pearson's correlation (using Spearman's correlation for non-normally distributed variables) for the continuous variables. Bonferroni correction was applied for these post-hoc tests separately.

Cohen's d effect size was derived using formulas described by Cohen (1988) DeCoster (2009) and Friedman (1968). All statistical tests were performed in SPSS 17.1.

3.4. Results

3.4.1. Baseline characteristics

The groups did not show baseline differences (see Table 3 for details).

Table 3. Characteristics of the study groups at baseline

	Intervention group Mean, median or count (SD, range or %) n = 34	Control group Mean, median or count (SD, range or %) n = 50	p value
Age	66.82 (11.47)	70.76 (11)	.118
Female	18 (52%)	36 (72%)	.074
Calmness (1-7)	5 (2-7)	5 (1-7)	.367
STAI - trait anxiety	41.59 (10.13)	44.22 (11.48)	.254
LVQoL	93.56 (15.75)	91.88 (17.42)	.678
Wellbeing (1-9)	7 (2-9)	7 (3-9)	.975
Visual acuity	0.5 (0.04-0.7)	0.3 (0.001-0.7)	.723

3.4.2. Hypothesis testing

Repeated measures analysis of HR did not reveal significant group differences ($F(1, 72) = 4.42$; $p = .039$; $d = -0.50$). However our results indicate that patients who received the intervention were calmer throughout the four measurement points ($F(1, 69)= 8.70$; $p = .004$; $d = 0.71$) and more cooperative during the operation ($U(81) = 533.5$; $Z = -2.59$ $p = .010$; $d = 0.60$). Additionally there was no evidence of group effects on Well-being ($F(1, 78)= 3.06$; $p =$

.084; d = 0.40) and Sleep quality (χ^2(df = 1; N = 84) = 0.66; p = .416 d = 0.21). (Also see Table 4).

Table 4 Group differences in Heart rate, Calmness, Cooperativeness, Wellbeing and Sleep quality

Variable name and Measurement point	Intervention group n	Intervention group Mean, median or count (SD, range or %)	Control group n	Control group Mean, median or count (SD, range or %)	p value
Heart rate (F(1, 72)= 4.42; p = .039; d = -0.50)					
Before surgery	34	74.79 (13.56)	49	79.86 (13.15)	
Surgery 1	33	69.52 (13.94)	49	74.45 (11.02)	
Surgery 2	33	68.15 (14.55)	48	73.33 (11.42)	
Surgery 3	32	67.16 (10.98)	45	73.89 (12.06)	
After surgery	34	67.09 (16.12)	48	71.56 (11.26)	
Calmness (1-7) (F(1, 69)= 8.70; p = .004*; d = 0.71)					
Before surgery	32	4.5 (2-7)	48	4 (2-7)	
After surgery	34	6 (3-7)	48	6 (1-7)	
End of surgery	33	6 (5-7)	48	4 (1-7)	
Postoperative visit	30	6 (4-7)	48	5 (2-7)	
Cooperativeness in the operating room (1-7) (U(81) = 533.5; Z = -2.59 p = .010*; d = 0.60)					
End of surgery	33	7 (4-7)	48	6 (2-7)	
Wellbeing (1-9) (F(1, 78)= 3.06; p = .084; d = 0.40)					
Before surgery	33	6 (3-9)	49	6 (2-9)	
After surgery	34	8 (5-9)	49	7 (1-9)	
Postoperative visit	33	8 (4-9)	49	8 (4-9)	
Sleep quality (Did you sleep well last night?) (χ^2(df = 1; N = 84) = 0.66; p = .416 d = 0.21)					
yes		24 (71%)		31 (62%)	
no		10 (29%)		19 (38%)	

Note. higher score and positive effect size means higher heart rate, calmer, more cooperative patient, better wellbeing and better sleep quality; [a] gender was used as a covariate; * significant result, critical value was set to $p < .01$ using Bonferroni correction

3.4.3. Post-hoc analyses

Because of the significant group effect on Calmness, further investigations were made to identify in which stages of the procedure was the difference the most pronounced. The groups showed no significant difference before, during and after the operation ($U(80) = 759$; $Z = -0.90$; $p = .928$; $d = 0.02$; ($U(81) = 553.5$; $Z = -2.41$; $p = .016$; $d = 0.56$); and $U(82) = 739.5$; $Z = -0.77$; $p = .443$; $d = 0.19$ respectively), but they were markedly calmer at the Postoperative visit ($U(78) = 337.5$; $Z = -4.12$; $p < .001$; $d = 1.25$).

The number of times listening to the audio CD at home showed no association with the main outcome measures. Results are summarized in Table 5.

Table 5 Association of number of exposures to the intervention with the outcome measures

Variable name and Measurement point	n	Correlation coefficient / t-test statistic	p value
*Heart rate*number of exposures*			
Before surgery	29	.13[a]	.500
Surgery 1	28	-.05[a]	.820
Surgery 2	28	-.03[a]	.901
Surgery 3	27	-.07[a]	.743
After surgery	29	-.06[a]	.760
*Calmness*number of exposures*			
Before surgery	27	.42[b]	.028
After surgery	28	.17[b]	.396
End of surgery	29	-.04[b]	.825
Postoperative visit	26	.15[b]	.462
*Cooperativeness in the operating room*number of exposures*			
End of surgery	28	-.14[b]	.486
*Wellbeing*number of exposures*			
Before surgery	28	.43[b]	.022
After surgery	29	.08[b]	.667
Postoperative visit	29	-.11[b]	.570
*Sleep quality*number of exposures*	29	0,16[c]	.876

Note.[a] Pearson correlation; [b] Spearman's rank correlation; [c] t-test statistic; critical value was set to $p < .0036$ using Bonferroni correction

3.5. Discussion and Conclusion

3.5.1. Discussion

Our randomized clinical trial investigated the effectiveness of a patient education intervention on cataract surgery patients. The intervention included information about the operation using positive verbal suggestions in addition to relaxation and imagery techniques. Patients in the intervention group were more cooperative during the procedure according to the surgeon and they appeared to be calmer, particularly at the post-operative visit, although groups did not differ with respect to heart rate during surgery, sleep quality at the night before surgery and subjective Well-being.

Based on these results the intervention might be considered as a tool to alleviate perioperative anxiety. As such, the intervention should be subjected to further, more focused investigation. According to Nijkamp, et al. (2002), the anxiety of the patients does not stop at the end of surgery, rather it carries on through the post-operative visit and beyond that. Our results imply that the relapse of anxiety at the time of the post-operative visit might be alleviated using a preoperative intervention.

Contrary to other medical fields, patients enlisted for cataract surgery often report that they already have enough information about the procedure (O'Malley, Newmark, Rothman, & Strassman, 1989; Pager, 2005) and thus they do not seek out additional information in the subject. However patients' actual level of understanding the operation and its risks is low, which raises issues about informed consent to the surgery (L. W. Morgan & Schwab, 1986; O'Malley, et al., 1989). Previous research found that many cataract surgery patients actively

avoid patient education as they find new information concerning (O'Malley, et al., 1989). Accordingly, another study suggested that patient education about cataract surgery may in fact increase negative expectations in the preoperative period which might counteract or mask early anxiety reduction effects of education interventions (Pager, 2005). These findings make the search for new methods in cataract patient education relevant. Our approach, using positive therapeutic suggestions in combination with information may be a way to deal with this problem, since shift of focus to the benefits of surgery and positive phrasing of the information content might decrease patients' natural apprehension. Nevertheless, preoperative anxiety appear to be unaffected by the present intervention as well, which could mean that the effects of negative expectations were not averted.

Another novelty of our approach was that we provided techniques that patients could use to overcome anxiety. Additional studies are needed to verify the necessity of more than one presentation of the intervention, in which the number of exposures is more strictly controlled.

We have to take into consideration the medication that was used perioperatively while interpreting our results. The Xanax taken before the operation could have masked some of the anti-anxiety effects of the intervention, which could serve as one possible explanation as to why we found no differences in anxiety on the day of the surgery. Further, blood pressure was medically controlled as well, since patients with chronic hypertension took their usual antihypertensive medication on the morning of the operation; and further antihypertensives were also used as needed if the BP of the patient was too high in the perioperative period.

3.5.2. Strengths and limitations

One of the strengths of our study is that we used multiple measurement points, which enabled us to assess the effectiveness of the intervention on several stages of anxiety

(Nijkamp, et al., 2002). Additionally, patients heard their surgeon's voice in our audio material, which allowed us to rely on surgeon-patient trust and relationship, factors of upmost importance in reducing perioperative anxiety (Lim, et al., 2011; Nijkamp, et al., 2002). Also this way the operating doctor's voice may have also been associated with the relaxed state elicited by the intervention.

Our study also has a number of limitations. First of all, no baseline measurements were made for the cardiovascular measures before the group allocation, thus we cannot be sure whether the groups differed in HR to begin with or not, although the group allocation was randomized and no dissimilarities were found in other baseline factors. Only one (passive) control condition was used in the study in addition to the intervention condition, which - in a single blind design - prevents us from ruling out expectancy effects, and from differentiating between the effects of different effective components of the intervention (information, relaxation, positive verbal suggestions, etc.). The high drop-out rate introduces further issues in the interpretation of the results, which could have been avoided with an intention-to-treat design. Although we assessed physiological and behavioral indicators of anxiety, we can only make inferences regarding the subjective anxiety level of the patients, which was not directly measured. Although classical self report measures of surgical anxiety (like Yale Preoperative Anxiety Scale (Kain, et al., 1997) the Amsterdam Preoperative Anxiety and Information Scale (Moerman, et al., 1996) and STAI State anxiety subscale) were considered for application, they turned out to be unpractical in this special environment, partly due to time constraints and the impaired visual capabilities of the patients. Finally, the results of the verbally administered STAI trait subscale and LVQoL tests have to be interpreted cautiously, because of the possible social desirability effects.

3.5.3. Conclusion

Our study indicates that preoperative patient education combined with positive suggestions and anxiety management techniques might reduce distress during the postoperative visit and help with patient-surgeon cooperation during the procedure; however there are considerable limitations that warrant further investigation. We encourage more research assessing the effects of such combined anxiety reduction interventions to investigate the effectiveness of different components and the need for multiple intervention presentations.

3.5.4. Practice Implications

Our study provides further support on the anxiety reducing effects of multi-component patient education programs before cataract surgery.

3.6. Acknowledgements

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3.7. Conflict of interest:

None.

4. The effectiveness of suggestive techniques in reducing post-operative side effects: a meta-analysis of randomized controlled trials

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4.1. Abstract

Background: Suggestive interventions are frequently used to alleviate surgical side effects, although moderators of effectiveness of such interventions are not fully understood.

Purpose: The present study investigated the efficacy of suggestive techniques in surgery and moderating factors.

Methods: We performed random effect meta-analysis and moderator analysis on the data of 45 studies meeting the inclusion criteria (n = 3,383).

Results: Suggestions reduced postoperative pain (g = 0.19; 95%CI=0.07-0.32) and nausea (g = 0.22; 95%CI=0.09-0.35) and did not significantly decrease anxiety, analgesic use, and length of surgery. Interventions presented during general anesthesia were less effective in reducing nausea ($\chi^2 = 4.19$; p = 0.041) but still had a small effect on pain and nausea. No moderator effect was revealed for hypnosis induction and recordings vs. live presentation.

Conclusions: Suggestions mitigate some postoperative side effects, but the effectiveness is smaller than previously reported. Further investigation is needed to identify moderators to enhance effectiveness.

Keywords: therapeutic suggestions; hypnosis; surgery; postoperative side effects

4.2. Introduction

In the middle of the 19th century hypnosis was frequently used as a sole anesthetic for surgical procedures, until the introduction of pharmaceutical anesthetics which quickly displaced hypnotic techniques (Wobst, 2007). After the British and the American Medical Association endorsed the use of hypnosis in medicine in the late 1950s suggestive techniques such as hypnosis and positive therapeutic suggestions made a reappearance, but not as full-fledged anesthetics rather as adjuncts to the routine medical treatment (1955; Rosen, 1960). The study of the effectiveness of this approach started not long after (Doberneck, Griffen Jr, & Papermaster, 1959; Egbert, Battit, Welch, & Bartlett, 1964). Earlier meta-analyses and reviews found that suggestive techniques were effective in reducing postoperative distress, pain, pain medication, nausea, and shortened recovery and treatment time (Flory, et al., 2007; Johnston & Vögele, 1993; Montgomery, et al., 2002; Schnur, et al., 2008; Tefikow, et al., 2013; Wobst, 2007), alhtough moderators of its effectiveness remain undiscovered.

Hypnosis is the most recognized psychological intervention applying suggestive techniques. In this intervention, suggestions are used after a formal 'hypnosis induction' which according to the classical viewpoint enhances responsiveness to suggestions (Farthing, 1992). However it is long debated whether hypnotic state really increases suggestibility and if it is linked to an altered state of consciousness (Kihlstrom, 1997, 2003; Kirsch & Lynn, 1995; Mazzoni, Venneri, McGeown, & Kirsch, 2012; Searle, 1997; Varga, 2011a). Some theories suggest that patients in medical settings (being in critical condition, or waiting for an invasive operation, etc.) can experience a spontaneous trance state (altered state of consciousness) without the use of formal hypnosis induction. (Bejenke, 1996a, 1996b; Cheek, 1969; Varga, 2004) Accordingly, there is evidence that suggestions without hypnotic induction (from here on, 'therapeutic suggestions') can have an influence on several perioperative outcome measures (Wobst, 2007). Thus one of the proposed moderators is hypnosis induction i.e.

whether formal hypnosis is an important element of suggestive interventions, or therapeutic suggestions without hypnosis are comparable in effectiveness. A previous meta-analysis (Schnur, et al., 2008) found that interventions labeled as suggestions are less effective in reducing perioperative distress compared to ones labeled as hypnosis, however in this analysis suggestion studies were not systematically sought.

With the rise in the number of studies applying pre-recorded suggestions, it is also a timely question whether recordings and live interventions are equally efficient in reducing post-operative side effects. Previous research is inconclusive, for example Blankfield (1991) proposed that live suggestions are more effective than audio recordings, and while one of the consequent meta-analyses supports this assumption (Schnur, et al., 2008), another one did not find adequate evidence (Montgomery, et al., 2002). If recordings and live interventions were equally effective, intervention costs could be reduced because pre-recorded suggestions can be given to several subjects simultaneously without the constant presence of specialists.

Another debated practice is the use of suggestions with unconscious patients, for example during general anesthesia. Studies yielded supporting (for example (C. Evans & Richardson, 1988; Furlong, 1990)) and contradicting (for example (Dawson, et al., 2001; van der Laan, et al., 1996)) results alike on the effectiveness of unconscious suggestions (Merikle & Daneman, 1996). This matter is not only practical but it can also bring us closer to understanding the mechanisms underlying suggestive effects.

The aim of the present study was to investigate the impact of perioperative suggestions on postoperative anxiety, pain, analgesic use, nausea, operational time and recovery. Additionally, three hypotheses were formed to assess potential moderating factors: 1) formal hypnotic induction is unnecessary to deliver suggestions successfully in medical settings; 2) recorded interventions and live presentation are equally effective; 3) suggestive techniques

presented during general anesthesia are less effective than ones presented to conscious subjects. PRISMA checklist can be found in Appendix A.

4.3. Methods

4.3.1. Data sources and search strategy

A literature search was conducted on five online databases (PubMed, CINAHL, PsycINFO and Proquest Dissertations & Theses Database) for studies focusing on hypnosis or suggestion interventions applied in surgery published between 1980 and 2012 with no limitations to language or publication status. We included journal articles, book chapters, and PhD theses. The last search was performed on 17th August 2012. We used the keywords ’hypnosis’, ’suggestion’ and ’surgery’ along with their variants and synonyms. The full list of search terms with the associated operators can be found in Appendix B. The reference lists of all eligible publications were reviewed to identify additional important studies.

4.3.2. Selection Criteria

The literature search was conducted in order to identify randomized controlled trials (RCTs) on the effectiveness of therapeutic suggestion or hypnosis applied adjunct to routine surgical care prior or during the operation. Non-RCTs, observational studies, and case reports were excluded from analysis. As children are more susceptible to hypnosis than adults studies conducted on a pediatric population were also excluded (A. H. Morgan & Hilgard, 1973; Schnur, et al., 2008). For reviews on hypnosis applied during unpleasant medical procedures and surgery with children, please consult Accardi and Milling (2009); or Kuttner (2012). We assessed the effectiveness of suggestive techniques compared to ‘regular treatment’ (no psychological intervention) or ‘attention control’ conditions.

4.3.3. Data extraction

Data extraction was performed by two authors independently (first and second authors) using a customized table. Disagreements were resolved by consensus. The extracted data included number of participants by study group, presence or absence of formal hypnosis induction, mode of intervention presentations (live or recorded, if both live and recorded presentation was used as part of the intervention, it was coded as live), timing of intervention (e.g. before surgery or during general anesthesia), type of surgical procedure and data required for assessment of methodological quality (see Risk of bias assessment).

4.3.4. Outcomes

Based on previous meta-analyses (Johnston & Vögele, 1993; Montgomery, et al., 2002; Schnur, et al., 2008), six outcome measures were selected: 1. anxiety or distress after the procedure, 2. pain intensity after the procedure, 3. pain medication used after the procedure, 4. nausea after the procedure, 5. recovery after the procedure, 6. length of the procedure. Included studies used a wide range of instruments to assess the aforementioned outcomes. For a comprehensive list of measures refer to Appendix C. As we were interested in the short-term effects of suggestions, only data measured until the ninth postoperative day were used from each study. To address ambiguities or the need for additional data, the corresponding authors of the papers were contacted via e-mail.

4.3.5. Risk of bias assessment

To assess the risk of bias of poor methodical quality we used a modified version of the Jadad scale (Jadad et al., 1996; Jüni, Witschi, Bloch, & Egger, 1999). Similarly to the original scoring system we evaluated studies in three domains: randomization (0-2 points: 1 point

added if described as randomized in the text and 1 additional point can be added or subtracted if the randomization process is described in detail and is deemed appropriate or inappropriate), reporting of dropouts (0-1 points: 1 point added if dropouts are reported) and blindness (0-2 points: again, 1 point added if the study is described as blinded and 1 additional point can be added or subtracted if the blinding method is detailed in the text and is deemed appropriate or inappropriate). Because hypnosis – contrary to therapeutic suggestions – by definition requires the active involvement of the subject, there are no hypnosis studies with double blind designs (Wobst, 2007). That is why a point was added for blindness even if the study was single blind (everyone but the subjects was blind for the research conditions). Only studies with at least three points were included in the data analysis.

Publication bias was assessed using Begg and Mazumdar's rank correlation (Begg & Mazumdar, 1994) of standardized effect size and its associated variance and the inspection of the funnel plots (Richard & Pillemer, 1984).

4.3.6. Statistical Analysis

4.3.6.1. Calculating treatment effect

We used a measure of standardized mean differences: corrected Hedges' g (referred to as 'g' from here on) as a measure of intervention effect size (Hedges, 1981). On the interpretation of g values see Table 6. (in Appendix D – supplementary tables and figures) based on Cohen's (Cohen, 1988) original table. If the mean and standard deviation was not reported in the original studies, equations detailed by Johnson and Eagly (2000), and Lipsey and Wilson (2001) were applied for the estimation of g. If more than one measure was used to assess the same effect, or in cases of multiple outcome measurement points, the effect sizes were combined to avoid multiple entries from the same study. We combined the effect sizes using

Rosenthal and Rubin's (1986) formula and DeCoster's (2004) recommendations. Unfortunately some of the studies did not report any test statistics or significance values for non-significant results. In these cases we assumed that g = 0 (referred to as 'imprecise inference' in the text from here on). However this method is regarded as an inaccurate estimation (DeCoster, 2004), so we performed a separate moderator analysis with imprecise inference as the moderator variable.

4.3.6.2. Statistical methods

Because of the large variety of surgical methods and intervention protocols used in the original trials, we assumed considerable study heterogeneity and opted for using Hedges and Vevea's (Hedges & Vevea, 1998) random effect model. Statistical heterogeneity measured by the I^2 statistic yielded medium ($I^2 > 50\%$) or high ($I^2 > 75\%$) values, which also supports the application of the random-effect approach (Higgins & Thompson, 2002; Higgins, Thompson, Deeks, & Altman, 2003). To investigate our main hypotheses we performed moderator analyses for three factors (hypnosis vs. therapeutic suggestions; recording vs. live presentation; unconscious vs. conscious participant) individually. The moderator analysis was only executed if at least four studies from both categories were present in the data-set. The moderator effect of using imprecise inference (g=0) was also tested. The analyses were performed for each outcome separately.

Data analysis was carried out in SPSS 17.1 with the syntax provided by Field and Gillett (2010). Funnel plots were generated using the R script by Vevea and Woods (2005).

4.4. Results

4.4.1. Study selection

As Figure 3 shows, the literature search identified 226 relevant records of which 139 were studies on the effectiveness of suggestive techniques in the perioperative period. These papers were retrieved in full text for further evaluation. 16 of these publications could not be retrieved (see the list in Appendix E). Excluding all methodologically inadequate, unavailable and duplicate publications left 45 studies that met the selection criteria. The 45 RCTs included a total of 3383 patients (range: N = 12 - 346). In these trials abdominal hysterectomy (14 studies) and cholecystectomy (7 studies) were the most commonly used surgical procedures; suggestions were presented before surgery (16 studies), during surgery but not under general anesthesia (8 studies), during general anesthesia (27 studies), or after surgery (5 studies). For four studies we entered more than one effect size from the same study into the meta-analysis because they used several experimental conditions relevant for our investigation. (See Table 7 for study characteristics).

Figure 3. Flow diagram

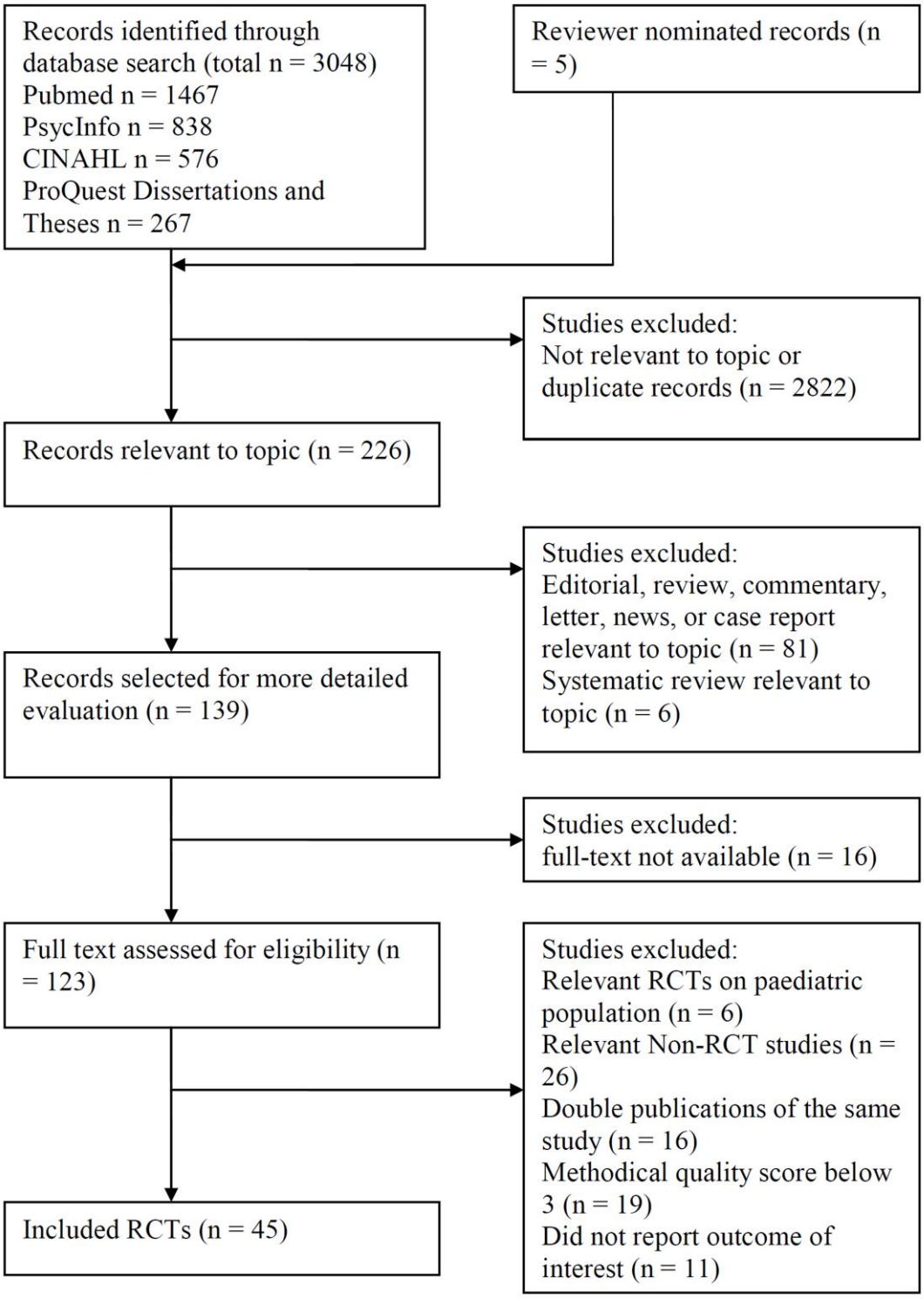


Table 7. Study characteristics

Study	Method. Quality	total n	Induction	Presentation	Timing	Outcome	Type of surgery
Ashton, et al., (1997)	4	32	hypnosis	live	a, c	anx, pme	coronary artery bypass surgery
Bethune, et al., (1993)	4	33	suggestion	recorded	d	anx, pai, nau, rec, ptm	coronary artery bypass surgery
Blankfield, et al., (1995)	3	63	suggestion	recorded	b, c	anx, pme, rec	coronary artery bypass surgery
Block, et al., (1991)	5	209	suggestion	recorded	d	anx, pai, pme, nau, rec	operation of the fallopian tubes, total abdominal hysterectomy, Vertical banded gastroplasty, cholecystectomy, ovarial cystectomy, myomectomy
Boeke, et al., (1988)	3	53	suggestion	recorded	d	pai, nau, rec, ptm	cholecystectomy
Bonke , et al., (1986)	3	61	suggestion	recorded	d	pai, pme, nau, rec, ptm	elective surgery of the gallbladder or the bile duct
Caseley-Rondi, et al., (1994)	4	74	suggestion	recorded	d	anx, pme, nau, rec	total abdominal hysterectomy
Cruise, et al., (1997)	3	60	suggestion	recorded	b	anx	cataract surgery
Dawson, et al., (2001)a*	5	70	suggestion	recorded	d	pai, pme	total abdominal hysterectomy

Dawson, et al., (2001)b*	5	69	suggestion	recorded	d	nau	total abdominal hysterectomy
Dawson, et al., (2001) c*	5	69	suggestion	recorded	d	pai, pme, nau	total abdominal hysterectomy
De Houwer, et al., (1996)	3	40	suggestion	recorded	d	anx, rec	coronary artery bypass surgery
Eberhart, et al., (1998)	5	71	suggestion	recorded	d	pai, pme, nau, ptm	thyroidectomy
Enqvist, et al. , (1997)	5	69	hypnosis	recorded	a	pai, pme, ptm	removal of third mandibular molars
Enqvist, et al., (1997)	4	48	hypnosis	recorded	a	pai, pme, nau, rec	elective breast reduction surgery
Evans, et al., (1988)	3	39	suggestion	recorded	d	anx, pai, nau, rec, ptm	total abdominal hysterectomy
Furlong, (1990)	3	19	suggestion	recorded	d	anx, pme, nau	abdominal gynaecologic surgery (abdominal hysterectomy, abdominal tuboplasty, abdominal salpinoophrectomy, abdominal myomectomy)
Furlong, et al., (1993)	3	105	suggestion	recorded	d	anx, pai, pme, nau	abdominal hysterectomy and mastectomy
Ginandes, et al., (2003)	5	12	hypnosis	live	a, c	pai	reduction mammaplasty
Goldmann, et al.,	3	30	suggestion	recorded	d	anx	elective

(1987)							cardiopulmonary bypass surgery
Hart, (1980)	4	40	hypnosis	recorded	a	anx	cardiopulmonary bypass surgery
Holden, (1985)	3	24	suggestion	recorded	a, c	anx	cholecystectomy
Jayaraman, et al., (2006)	3	66	suggestion	recorded	d	pai, nau	laparoscopic cholecystectomy
Kekecs, et al., (2012)	5	82	suggestion	recorded	a	anx, rec, ptm	cataract surgery
Lang, et al., (2000)	5	161	hypnosis	live	b	ptm	percutaneous transcatheter diagnostic and therapeutic peripheral vascular and renal interventions
Lauder, et al. (1995)	4	190	suggestion	live	a	nau	total abdominal hysterectomy
Lebovits, et al., (1999)	4	70	suggestion	recorded	d	pai, pme, nau	elective outpatient hernia repair
Liu, et al., (1992)	4	48	suggestion	recorded	d	pai, pme, nau, rec, ptm	total abdominal hysterectomy
Marc, et al., (2007)	3	29	hypnosis	live	a, b	anx, pai, ptm	first-trimester surgical abortion
Marc, et al., (2008)	3	346	hypnosis	live	a, b	anx, pai, ptm	first-trimester surgical abortion
Mastropietro (1998)a*	5	66	suggestion	recorded	d	pai, pme	open gynecologic procedures
Mastropietro, (1998)b*	5	59	suggestion	recorded	d	pai, pme	open gynecologic procedures

McLintock, et al., (1990a)	4	60	suggestion	recorded	d	pai, pme, nau	elective abdominal hysterectomy
McLintock, et al., (1990b)	3	40	suggestion	recorded	d	pai, pme, nau	abdominal hysterectomy
McWilliams, (1990)	3	60	suggestion	recorded	d	pme, rec	lumbar laminectomy
Melzack, et al., (1996)	3	20	suggestion	recorded	d	pai, pme	cholecystectomy or hysterectomy
Montgomery, et al., (2007)	5	200	hypnosis	live	a	anx, pai, pme, nau, ptm	excisional breast biopsy or lumpectomy
Münch, et al., (1990)	3	36	suggestion	recorded	d	pai, nau	thyroidectomy
Nilsson, et al., (2001)	5	59	suggestion	recorded	d	pai, pme, nau, ptm	elective abdominal hysterectomy
Nilsson, et al., (2003)	4	120	suggestion	recorded	c	anx, pai, pme, nau	varicose vein or open inguinal hernia repair
Renna, et al., (2000)	5	46	suggestion	recorded	d	pai, nau	minor gynaecological surgery
Ross, (1982)	3	18	hypnosis	recorded	a, b	pme	Third Molar Surgery
Steinberg, et al., (1993)	4	60	suggestion	recorded	d	anx, pai, pme, nau	total abdominal hysterectomy or breast reconstruction by transverse rectus abdominus musculocutaneous reconstruction
Szeverényi, et al., (2012)	5	64	suggestion	live	a, b	pme	hip or knee prosthesis implantation
Taenzer, (1983)	4	20	hypnosis	live	a	anx, pai,	elective gallbladder

						pme, rec	surgery
van der Laan, et al., (1996)a*	3	40	suggestion	recorded	a	anx, pai, pme, nau	hysterectomy, myomectomy, or gynecologic laparotomy.
van der Laan, et al., (1996)b*	3	40	suggestion	recorded	d	anx, pai, pme, nau	hysterectomy, myomectomy, or gynecologic laparotomy.
Williams, et al. , (1994)	3	51	suggestion	recorded	d	pme, nau,	routine major gynaecological surgery
Woo, et al., (1987)a*	4	14	suggestion	recorded	d	pme	abdominal hysterectomy
Woo, et al., (1987)b*	4	14	suggestion	recorded	a, b	pme	abdominal hysterectomy
Woo, et al., (1987)c*	4	14	suggestion	recorded	a, b	pme	abdominal hysterectomy

*Note: * data extracted for multiple intervention groups; intervention: suggestion refers to therapeutic suggestions; timing: a - before surgery; b - during surgery; c - after surgery; d - only during general anesthesia; outcome: anx - anxiety; pai - pain; pme - pain medication; nau - nausea; rec - recovery; ptm - procedure time*

4.4.2. Outcome selection

The general effect of suggestions was investigated on five outcome measures (postoperative anxiety, pain intensity, pain medication, nausea, and procedure time). Recovery after surgery had to be dropped from all analyses as almost half (6 out of 13) of these studies did not report non-significant results properly, and because of the unbalance in the occurrence of moderators

of interest (there was only one study with live presentation and two with formal hypnosis induction). We excluded procedure time from moderator analyses only, because of the low number of studies and clustering of the moderator conditions: formal hypnosis, live presentation and conscious presentation were typically in the same studies, while studies with recorded interventions and unconscious presentation were almost exclusively used in studies with therapeutic suggestions.

4.4.3. The effect of imprecise inference and publication bias

Table 8 shows that when studies with imprecise inference were excluded, pooled effect sizes on all outcome measures were slightly larger; however none of these differences reached significance. Likewise, Funnel plots presented in Figure 4 to Figure 8 in Appendix D demonstrate that publication bias was not evident for any of the outcome measures.

Table 8. Effect sizes with and without imprecise inference

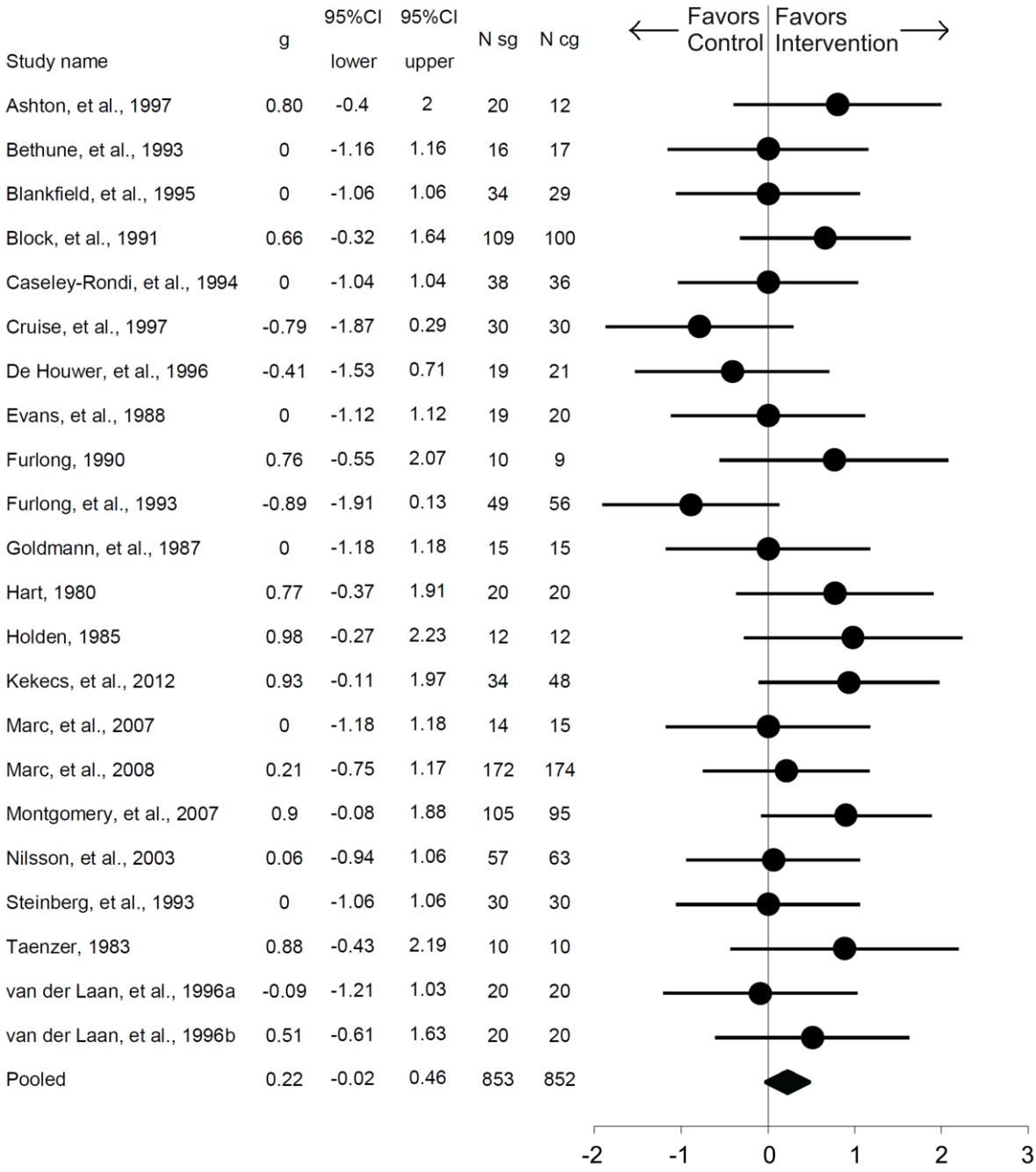
	Mean effect size, Lower and upper bounds and Z test							Heterogeneity		Moderator effect	
	Mean g	SE	95%CI lower	95%CI upper	z	p	k	I^2	p	χ^2	p
Anxiety (all studies)	0.22	0.12	-0.03	0.47	1.82	.083	22	79,92	<.001	1.25	.264
Anxiety (without imprecise inference)	0.30	0.15	0	0.60	1.97	.049	16	84.82	<.001		
Pain intensity (all studies)	0.19	0.07	0.07	0.32	2.95	.003	31	63.33	.001	0.45	.504
Pain intensity (without imprecise	0.22	0.08	0.07	0.38	2.81	.005	22	54.31	.001		

inference)											
Pain medication (all studies)	0.12	0.07	-0.02	0.26	1.73	.084	33	54.34	<.001		
Pain medication (without imprecise inference)	0.14	0.08	-0.02	0.31	1.75	.081	28	61.02	<.001	0.54	.462
Nausea (all studies)	0.22	0.07	0.09	0.35	3.32	.001	27	47.84	.003		
Nausea (without imprecise inference)	0.25	0.08	0.10	0.41	3.21	.001	21	61.93	<.001	1.18	.277
Procedure time (all studies)	0.10	0.08	-0.06	0.26	1.25	.213	13	39.64	.069		
Procedure time (without imprecise inference)	0.11	0.09	-0.08	0.28	1.15	.249	11	47.84	.038	0.19	.667

4.4.4. General effect of suggestions

Meta-analysis results for the effects of suggestion intervention on all outcome variables are presented in Figures 9-13. We found significant reduction in postoperative pain intensity (g = 0.19; 95% CI = 0.07, 0.32) and postoperative nausea (g = 0.22; 95% CI = 0.09, 0.35); whereas no significant effect was noted for postoperative anxiety (g = 0.22; 95% CI = -0.03, 0.47), analgesic drug consumption (g = 0.12; 95% CI =-0.02, 0.26) and procedure time (g = 0.10; 95% CI = -0.06, 0.26).

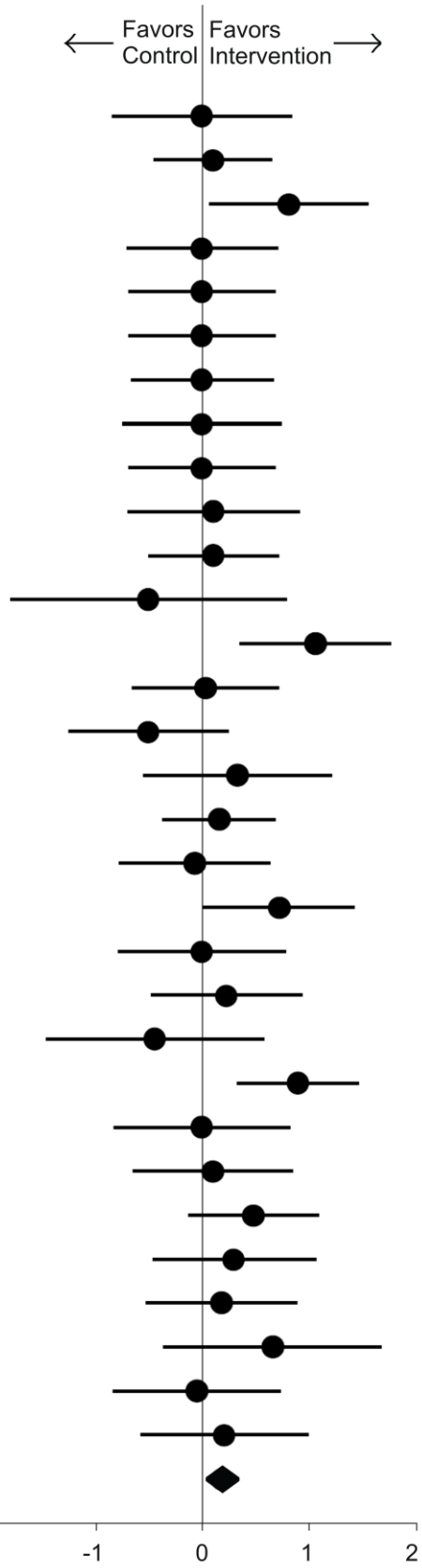
Figure 9. Effects of suggestive techniques on postoperative anxiety



The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black discs show the point estimates of the effect of individual studies with horizontal lines corresponding to 95% CIs. The filled diamond represent the pooled estimates for all studies. The sample sizes of the suggestion (N sg) and control groups (N cg) of each study is also displayed.

Figure 10. Effects of suggestive techniques on postoperative pain intensity

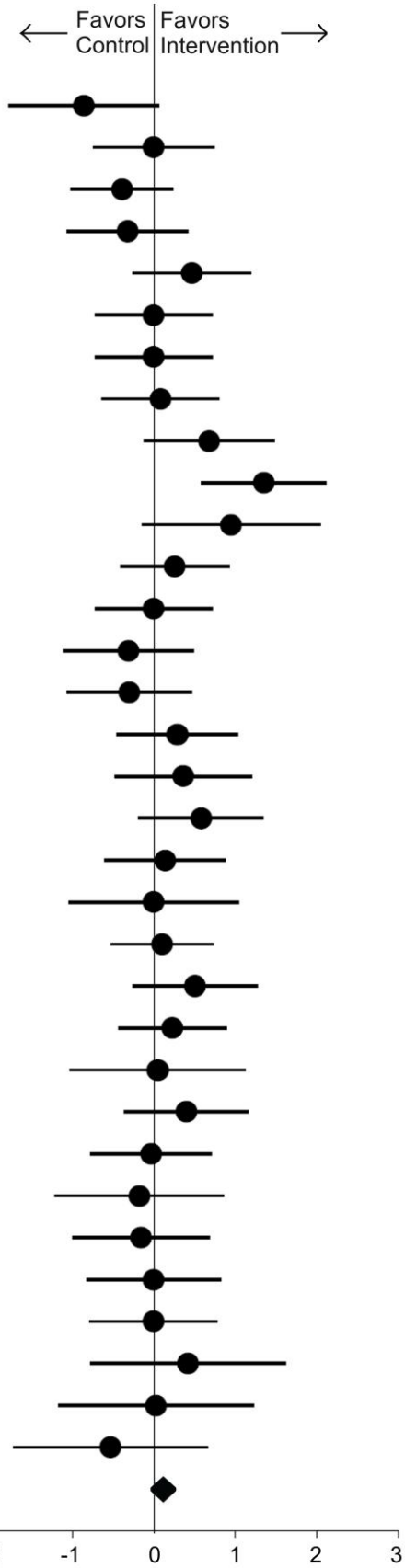
Study name	g	95%CI lower	95%CI upper	N sg	N cg
Bethune, et al., 1993	0	-0.84	0.84	16	17
Block, et al., 1991	0.10	-0.45	0.65	109	100
Boeke, et al., 1988	0.81	0.07	1.55	24	29
Bonke , et al., 1986	0	-0.71	0.71	31	30
Dawson, et al., 2001a	0	-0.69	0.69	34	35
Dawson, et al., 2001b	0	-0.69	0.69	35	35
Eberhart, et al., 1998	0	-0.67	0.67	36	35
Enqvist, et al., 1997a	0	-0.74	0.74	23	25
Enqvist, et al., 1997b	0	-0.69	0.69	33	36
Evans, et al., 1988	0.11	-0.69	0.91	19	20
Furlong, et al., 1993	0.11	-0.50	0.72	52	56
Ginandes, et al., 2003	-0.50	-1.79	0.79	6	5
Jayaraman, et al., 2006	1.06	0.35	1.77	32	34
Lebovits, et al., 1999	0.03	-0.66	0.72	34	36
Liu, et al., 1992	-0.50	-1.24	0.24	24	24
Marc, et al., 2007	0.33	-0.55	1.21	14	15
Marc, et al., 2008	0.16	-0.37	0.69	162	156
Mastropietro, 1998a	-0.07	-0.78	0.64	24	35
Mastropietro, 1998b	0.72	0.01	1.43	31	35
McLintock, et al., 1990a	0	-0.78	0.78	20	20
McLintock, et al., 1990b	0.23	-0.48	0.94	30	30
Melzack, et al., 1996	-0.44	-1.46	0.58	10	10
Montgomery, et al., 2007	0.90	0.33	1.47	105	95
Münch, et al., 1990	0	-0.82	0.82	18	18
Nilsson, et al., 2001	0.10	-0.64	0.84	26	24
Nilsson, et al., 2003	0.48	-0.13	1.09	57	63
Renna, et al., 2000	0.30	-0.46	1.06	23	23
Steinberg, et al., 1993	0.18	-0.53	0.89	30	30
Taenzer, 1983	0.66	-0.36	1.68	10	10
van der Laan, et al., 1996a	-0.05	-0.83	0.73	20	20
van der Laan, et al., 1996b	0.21	-0.57	0.99	20	20
Pooled	0.19	0.05	0.33	1108	1121



The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black discs show the point estimates of the effect of individual studies with horizontal lines corresponding to 95% CIs. The filled diamond represent the pooled estimates for all studies. The sample sizes of the suggestion (N sg) and control groups (N cg) of each study is also displayed.

Figure 11. Effects of suggestive techniques on postoperative pain medication requirement

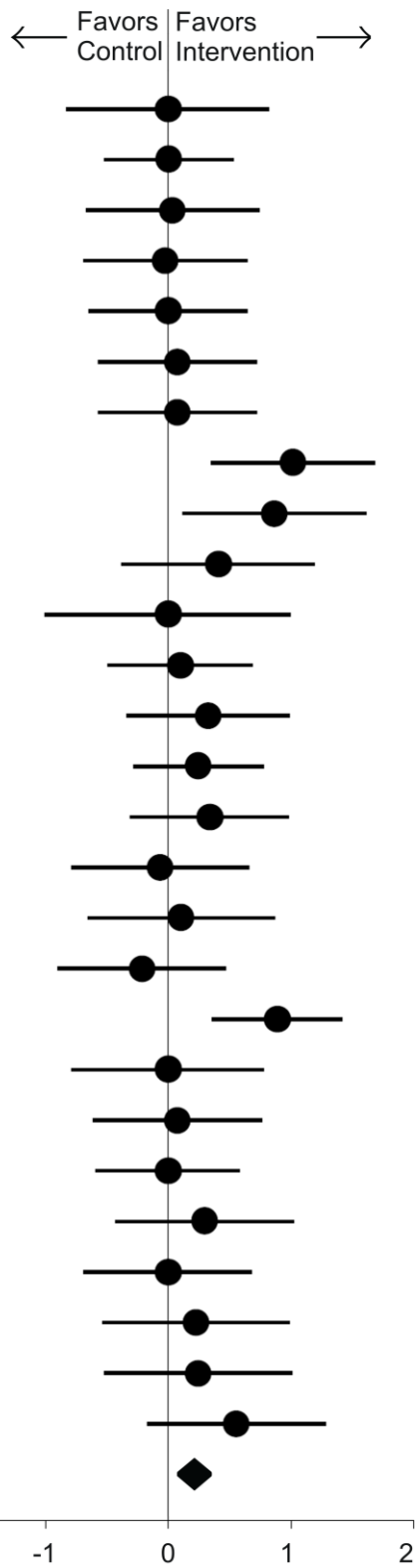
Study name	g	95%CI lower	95%CI upper	N sg	N cg
Ashton, et al., 1997	-0.86	-1.78	0.06	20	12
Blankfield, et al., 1995	0	-0.74	0.74	34	29
Block, et al., 1991	-0.39	-1.02	0.24	109	100
Bonke , et al., 1986	-0.32	-1.06	0.42	31	30
Caseley-Rondi, et al., 1994	0.47	-0.26	1.20	38	36
Dawson, et al., 2001a	0	-0.73	0.73	34	35
Dawson, et al., 2001b	0	-0.73	0.73	35	35
Eberhart, et al., 1998	0.08	-0.65	0.81	36	35
Enqvist, et al., 1997a	0.68	-0.12	1.48	23	25
Enqvist, et al., 1997b	1.35	0.59	2.11	33	36
Furlong, 1990	0.95	-0.15	2.05	10	9
Furlong, et al., 1993	0.26	-0.41	0.93	52	56
Lebovits, et al., 1999	0	-0.73	0.73	34	36
Liu, et al., 1992	-0.31	-1.11	0.49	24	24
Mastropietro, 1998a	-0.30	-1.06	0.46	24	35
Mastropietro, 1998b	0.29	-0.45	1.03	31	35
McLintock, et al., 1990a	0.36	-0.48	1.20	20	20
McLintock, et al., 1990b	0.58	-0.18	1.34	30	30
McWilliams, 1990	0.14	-0.6	0.88	30	30
Melzack, et al., 1996	0	-1.04	1.04	10	10
Montgomery, et al., 2007	0.1	-0.53	0.73	105	95
Nilsson, et al., 2001	0.51	-0.25	1.27	31	28
Nilsson, et al., 2003	0.23	-0.44	0.90	57	63
Ross, 1982	0.05	-1.03	1.13	9	9
Steinberg, et al., 1993	0.4	-0.36	1.16	30	30
Szeverényi, et al., 2012	-0.03	-0.77	0.71	31	33
Taenzer, 1983	-0.18	-1.22	0.86	10	10
van der Laan, et al., 1996a	-0.16	-1	0.68	20	20
van der Laan, et al., 1996b	0	-0.82	0.82	20	20
Williams, et al., 1994	0	-0.78	0.78	22	29
Woo, et al., 1987a	0.42	-0.78	1.62	7	7
Woo, et al., 1987b	0.03	-1.17	1.23	7	7
Woo, et al., 1987c	-0.53	-1.73	0.67	7	7
Pooled	0.12	-0.02	0.26	1014	1016



The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black discs show the point estimates of the effect of individual studies with horizontal lines corresponding to 95% CIs. The filled diamond represent the pooled estimates for all studies. The sample sizes of the suggestion (N sg) and control groups (N cg) of each study is also displayed.

Figure 12. Effects of suggestive techniques on postoperative nausea

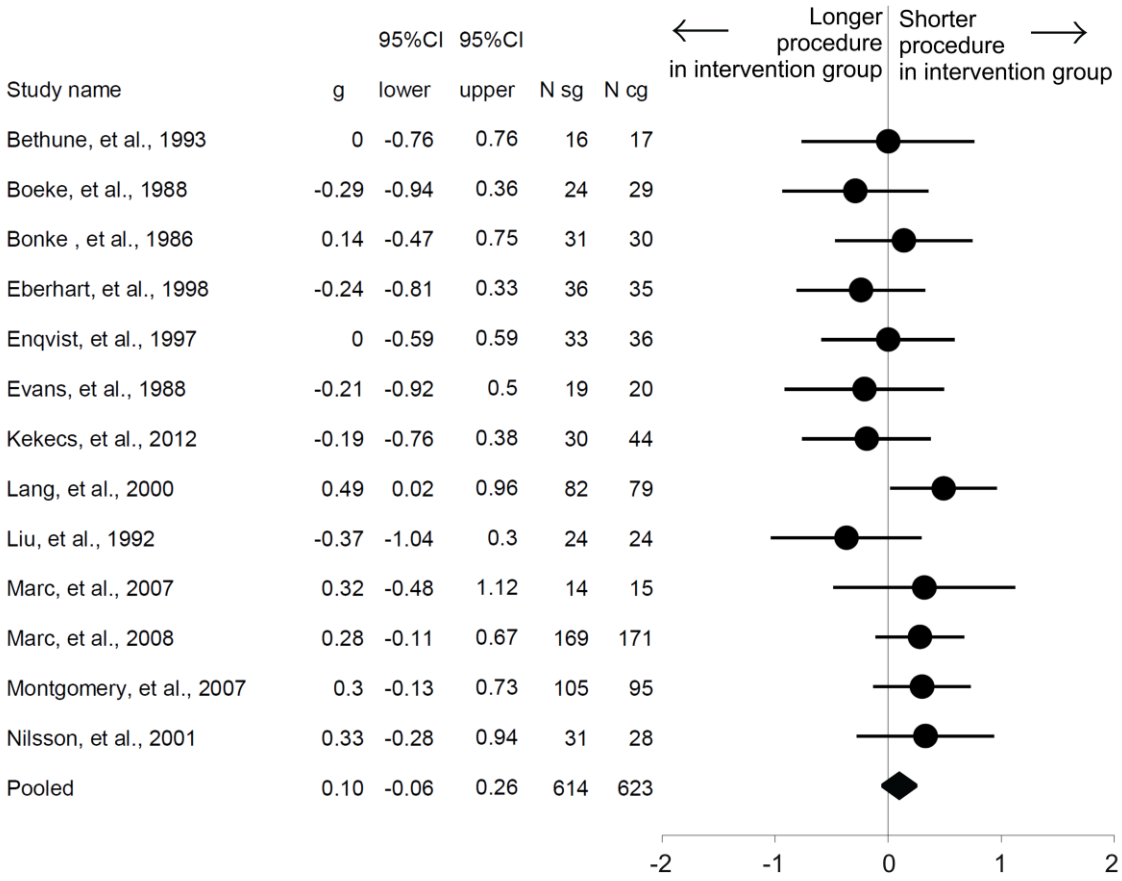
Study name	g	95%CI lower	95%CI upper	N sg	N cg
Bethune, et al., 1993	0	-0.82	0.82	16	17
Block, et al., 1991	0.01	-0.52	0.54	109	100
Boeke, et al., 1988	0.04	-0.67	0.75	23	29
Bonke , et al., 1986	-0.02	-0.69	0.65	31	30
Caseley-Rondi, et al., 1994	0	-0.65	0.65	38	36
Dawson, et al., 2001a	0.08	-0.57	0.73	34	35
Dawson, et al., 2001b	0.08	-0.57	0.73	34	35
Eberhart, et al., 1998	1.02	0.35	1.69	36	35
Enqvist, et al., 1997	0.87	0.13	1.61	23	25
Evans, et al., 1988	0.41	-0.37	1.19	19	20
Furlong, 1990	0	-1	1	10	9
Furlong, et al., 1993	0.10	-0.49	0.69	52	56
Jayaraman, et al., 2006	0.33	-0.34	1	32	34
Lauder, et al., 1995	0.25	-0.28	0.78	93	97
Lebovits, et al., 1999	0.34	-0.31	0.99	34	36
Liu, et al., 1992	-0.06	-0.79	0.67	24	24
McLintock, et al., 1990a	0.11	-0.65	0.87	20	20
McLintock, et al., 1990b	-0.21	-0.9	0.48	30	30
Montgomery, et al., 2007	0.89	0.36	1.42	105	95
Münch, et al., 1990	0	-0.78	0.78	18	18
Nilsson, et al., 2001	0.08	-0.61	0.77	30	28
Nilsson, et al., 2003	0	-0.59	0.59	53	56
Renna, et al., 2000	0.30	-0.43	1.03	23	23
Steinberg, et al., 1993	0	-0.69	0.69	30	30
van der Laan, et al., 1996a	0.23	-0.53	0.99	20	20
van der Laan, et al., 1996b	0.25	-0.51	1.01	20	20
Williams, et al., 1994	0.56	-0.17	1.29	22	29
Pooled	0.22	0.08	0.36	979	987



The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black discs show the point estimates of the effect of individual studies with horizontal

lines corresponding to 95% CIs. The filled diamond represent the pooled estimates for all studies. The sample sizes of the suggestion (N sg) and control groups (N cg) of each study is also displayed.

Figure 13. Effects of suggestive techniques on procedure time



The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black discs show the point estimates of the effect of individual studies with horizontal lines corresponding to 95% CIs. The filled diamond represent the pooled estimates for all studies. The sample sizes of the suggestion (N sg) and control groups (N cg) of each study is also displayed.

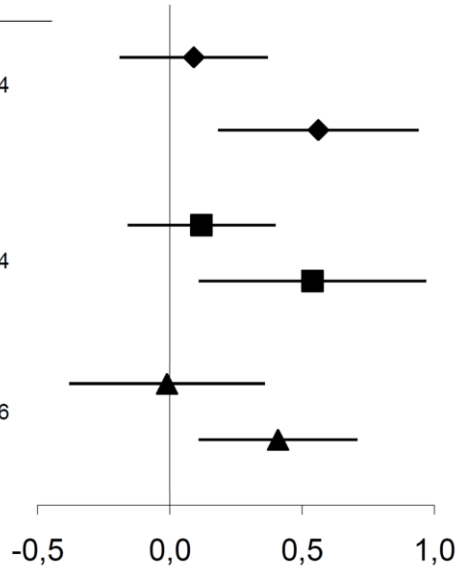
4.4.5. Analysis of moderators

4.4.5.1. Effects on postoperative anxiety

While interventions using hypnosis (g = 0.54; 95% CI = 0.20, 0.95), live presentation (g = 0.57; 95% CI = 0.11, 0.97) or presenting the suggestions while patients were conscious (g = 0.41; 95% CI = 0.11, 0.71) significantly reduced postoperative anxiety with medium effect sizes, mitigation of anxiety was not significant in studies where therapeutic suggestions (g = 0.09; 95% CI = -0.20, 0.37), recorded intervention (g = 0.12; 95% CI = -0.16, 0.40) or unconscious presentation of suggestions (g = -0,01; 95% CI = -0.38, 0.36) was used. None the less there was no significant moderator effect revealed (see Figure 14).

Figure 14. Moderator effects on postoperative anxiety

	Meta-analysis				Moderator-analysis	
	Mean g	95%CI lower	95%CI upper	p (meta)	χ^2	p (moderator)
Therapeutic suggestions	0.09	-0.20	0.37	.560	3.44	.064
Hypnosis	0.57	0.20	0.95	.003		
Replayed recording	0.12	-0.16	0.40	.387	2.14	.144
Live presentation	0.54	0.11	0.97	.014		
Unconscious	-0,01	-0.38	0.36	.942	3.14	.076
Conscious	0.41	0.11	0.71	.008		



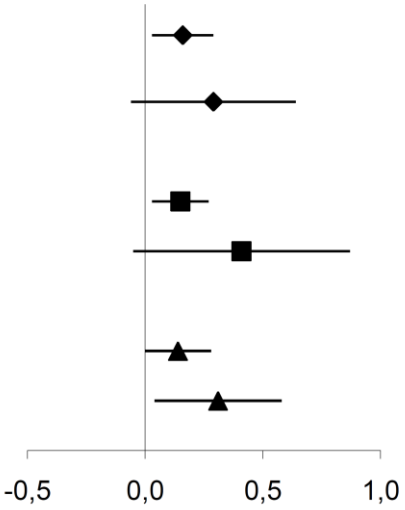
The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black diamonds (hypnosis or therapeutic suggestions), squares (live or recorded suggestions) and triangles (conscious or unconscious presentation) show the point estimates of the pooled effects of studies using the same moderator condition with horizontal lines corresponding to 95% CIs.

4.4.5.2. Effects on postoperative pain intensity

Therapeutic suggestions (g = 0.16; 95% CI = 0.03, 0.29) and replayed recordings (g = 0.15; 95% CI = 0.03, 0.27) significantly decreased pain intensity after the operation, just like both suggestions presented to awake (g = 0.31; 95% CI = 0.05, 0.58) and generally anesthetized patients (g = 0.14; 95% CI = 0.00, 0.28). No significant effect was shown for hypnosis (g = 0.29; 95% CI = -0.07, 0.64) and live presentation (g = 0.41; 95% CI = -0.06, 0.87). None of the moderator effects were significant (see Figure 15).

Figure 15. Moderator effects on postoperative pain intensity

	Meta-analysis				Moderator-analysis	
	Mean g	95%CI lower	95%CI upper	p (meta)	X^2	p (moderator)
Therapeutic suggestions	0.16	0.03	0.29	.014	0.87	.352
Hypnosis	0.29	-0.07	0.64	.116		
Replayed recording	0.15	0.03	0.27	,014	3,76	.097
Live presentation	0.41	-0.06	0.87	,089		
Unconscious	0.14	-0.00	0.28	.045	1.78	.182
Conscious	0.31	0.05	0.58	.022		



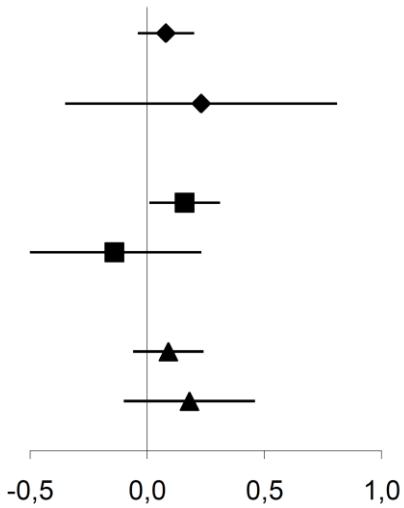
The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black diamonds (hypnosis or therapeutic suggestions), squares (live or recorded suggestions) and triangles (conscious or unconscious presentation) show the point estimates of the pooled effects of studies using the same moderator condition with horizontal lines corresponding to 95% CIs.

4.4.5.3. Effects on postoperative pain medication

Recorded suggestions reduced postoperative analgesic requirements (g = 0.16; 95% CI = 0.01, 0.31), while the effect on pain medication use did not reach statistical significance in any other moderator state, and no moderator effects have been identified either (see Figure 16).

Figure 16. Moderator effects on postoperative pain medication requirement

	Meta-analysis				Moderator-analysis	
	Mean g	95%CI lower	95%CI upper	p (meta)	χ^2	p (moderator)
Therapeutic suggestions	0.08	-0.04	0.20	.188	1.09	.297
Hypnosis	0.23	-0.35	0.81	.438		
Replayed recording	0.16	0.01	0.31	.037	2,05	.152
Live presentation	-0.14	-0.50	0.23	.465		
Unconscious	0,09	-0.07	0.24	.269	0.43	.514
Conscious	0.18	-0.11	0.46	.222		



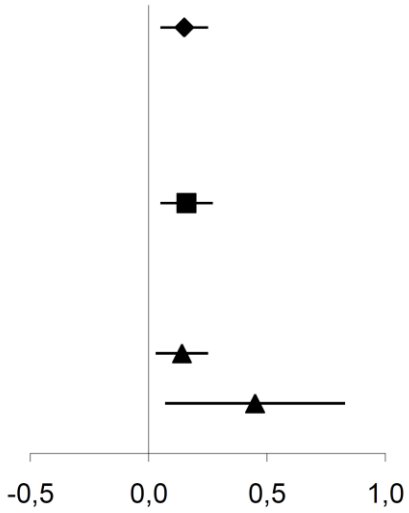
The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black diamonds (hypnosis or therapeutic suggestions), squares (live or recorded suggestions) and triangles (conscious or unconscious presentation) show the point estimates of the pooled effects of studies using the same moderator condition with horizontal lines corresponding to 95% CIs.

4.4.5.4. Effects on postoperative nausea

A significant moderator effect was revealed favoring conscious listening ($\chi^2 = 4.19$; $p < .041$): although unconsciously presented suggestions did also reduce nausea by a small amount (g = 0.14; 95% CI = 0.04, 0.25), listening to suggestions consciously mitigated nausea more effectively (g = 0.45; 95% CI = 0.07, 0.83). Therapeutic suggestions (g = 0.15; 95% CI = 0.05, 0.24) and recorded suggestions (g = 0.16; 95% CI = 0.05, 0.27) also significantly decreased postoperative nausea (see Figure 17).

Figure 17. Moderator effects on postoperative nausea

	Meta-analysis					Moderator-analysis
	Mean g	95%CI lower	95%CI upper	p (meta)	χ^2	p (moderator)
Therapeutic suggestions	0.15	0.05	0.24	0.002		
Hypnosis[a]						
Replayed recording	0.16	0.05	0.27	0.004		
Live presentation[a]						
Unconscious	0.14	0.04	0.25	,010	4.19	.041
Conscious	0.45	0.07	0.83	,021		



The effect is expressed as corrected Hedges g (g) with associated 95% confidence intervals (CI). Black diamonds (hypnosis or therapeutic suggestions), squares (live or recorded suggestions) and triangles (conscious or unconscious presentation) show the point estimates of the pooled effects of studies using the same moderator condition with horizontal lines corresponding to 95% CIs. [a] - fewer than four studies used hypnosis and live presentation, thus meta analyses of the effect of these moderators and moderator comparisons with therapeutic suggestions and live presentation were not performed.

Table 9 summarizes the results of the separate meta-analyses of studies using the same moderator conditions for all outcomes, while Tables 10-14 in Appendix D show the detailed results of the meta-analysis, heterogeneity statistics and moderator analysis for the different outcomes.

Table 9. Summary of the effects of moderators on postoperative outcomes

	Anxiety	Pain intensity	Pain medication	Nausea[a]	Procedure time[b]
All studies	0.22	0.19**	0.12	0.22***	0.10
Therapeutic suggestions	0.09	0.16*	0.08	0.15**	
Hypnosis	0.57**	0.29	0.23		
Replayed recording	0.12	0.15*	0.16*	0.16**	
Live presentation	0.54*	0.41	-0.14		
Unconscious	-0,01	0.14*	0,09	0.14*	
Conscious	0.41**	0.31	0.18	0.45*	

Note: Positive effect sizes mean lower postoperative anxiety, pain, pain medication requirement, nausea and shorter procedure time; a - fewer than four studies used hypnosis and live presentation to decrease nausea, thus meta-analyses of the effect of these moderators were not performed; b - because of the low number of studies and clustering of the moderator conditions the moderators for procedure time were not individually analyzed (see also the outcome selection section); * $p < .05$; ** $p < .01$; *** $p < 0.001$.

4.5. Discussion

The present study combined the results of forty-five studies to investigate the effects of suggestive interventions in surgical settings, and to explore the factors that moderate their effectiveness. We found that suggestion interventions overall reduced postoperative pain intensity and nausea. However postoperative anxiety, pain medication requirement and procedure time were not significantly affected by suggestions. The moderator analysis revealed that suggestions are less effective in reducing postoperative nausea if they are presented during general anesthesia while no other moderator effects were identified.

Present results are comparable to the low to medium effect sizes reported by previous meta-analyses in adult population (Flammer & Bongartz, 2003; Schnur, et al., 2008; Tefikow, et al., 2013). However it is notable that intervention effects on anxiety, pain and pain medication were markedly smaller in the present analysis than the ones reported by Montgomery and colleges (2002). The discrepancy may be explained by differences in study inclusion criteria and the applied statistical methods. Contrary to the present meta-analysis, Montgomery and colleges also included non-RCTs, but studies that did not report adequate statistics were excluded, which could have resulted in the omission of poorly reported null-results. Furthermore, they used a fixed effect model. All of these methodical choices could have led to an overestimation of the intervention effects. For example our data indicate that approximately 62% of patients who received hypnosis had lower pain intensity after surgery than the average pain reported in the control group, while the previous meta-analysis suggested 95%. Overall, we argue that suggestive techniques can indeed be useful adjuncts to surgical care; however their effectiveness in reducing surgical side-effects is smaller than previously suggested (Montgomery, et al., 2002).

Our results did not support the lower effectiveness of therapeutic suggestions compared to hypnosis or the recorded suggestions compared to live ones in the majority of the

investigated outcomes. This could spell good news for the cost effectiveness of suggestive techniques as therapeutic suggestions require less training to learn and take less time to use than formal hypnosis, in addition recordings do not require the continuous presence of specialists and can be applied in mass numbers. It is important to note though, that one of the main advantages of a live psychological intervention might be its adaptability to the patient; a characteristic which cannot be easily grasped by empirical studies.

Contrary to a previous meta-analysis (Merikle & Daneman, 1996) we did not find that suggestions received under general anesthesia reduced postoperative analgesic consumption. However the aforementioned study investigated only four studies involving patient controlled anesthesia. Although we did find that suggestions given under general anesthesia significantly mitigated post-operative pain intensity and nausea. These effects were small, but their mere existence is important in the exploration of the mechanisms involved. Some theorists argue that the effective component of therapeutic suggestions is the meaning of the communication (Weitzenhoffer, 1989). If this theory is true, suggestions should not have an effect when applied under general anesthesia, as semantic processing was found to be impaired in this state (Davis et al., 2007; Deeprose, Andrade, Harrison, & Edwards, 2005; Kihlstrom & Cork, 2007). The fact that they do influence postoperative outcomes may suggest a meaning independent non-specific effect of these interventions; for instance blocking the unpleasant noises coming from the operating room by the headphones (Bonke, et al., 1986; Thiele, Knipper, Dunn, & Nemergut, 2013), or a soothing human voice heard during surgery may reduce stress (Couture & Bennett, 1990). These findings might also suggest that semantic processing is not entirely blocked in anesthesia and that information relevant for the patient may get analyzed (Varga, Jakubovits, & Janecskó, 1995). Targeted investigation with the use of proper control conditions may help to address these interpretations. On the meantime for

therapeutic purposes we advise the application of suggestions while the patient is awake to achieve higher effectiveness.

We have to keep in mind that our results can only be generalized to the selected outcomes, which are the most frequently studied but also the most general ones. The clinically most relevant outcome measures are different from procedure to procedure, and there is a possibility, that some of the suggestive interventions are specifically tailored and are most effective in controlling these (e.g. the main aim of the intervention in the study of Szeverényi (2012) is to reduce bleeding during orthopedic surgery).

4.5.1. Limitations

The present study has a number of limitations. A large portion of the studies did not report baseline statistics for the majority of outcome measures, so only between subjects comparisons were used in the meta-analysis. This way we have no access to data on change over time which could have led to more accurate estimation of effect sizes. The overlap between moderator conditions could have confounded the findings as well, e.g. studies with hypnosis induction were typically given to conscious patients, meaning that the benefits of conscious processing and formal hypnosis are hard to distinguish. The inclusion of single blind trials and that most of the included studies used only passive control groups (i.e. regular treatment) might have resulted in a bias favoring the intervention because of expectancy effects. Relatedly, the effects of hypnosis can be inflated as hypnosis induction was only used in single blind designs. Further, 16 of the 139 studies selected for detailed full text assessment could not be retrieved, and our analysis did not take into consideration possible additional moderators of effectiveness, like the experience level of the surgeon; the number of repetitions of the suggestions; and whether the suggestions were personalized for the individual patients.

4.5.2. Conclusion

Our research addressed several questions from the current literature – some of which (e.g. the comparison of formal hypnosis and therapeutic suggestions) have never been systematically tested before – using a relatively large study pool. Overall our results indicate that suggestive interventions can help surgical patients to cope with postoperative pain, and nausea, although the effect sizes are generally small; furthermore that giving suggestions under general anesthesia reduce efficiency compared to conscious presentation in reducing nausea.

The goal of further projects could be to find new moderators through which effectiveness of suggestive interventions could be improved. For this purpose the systematic evaluation of the suggestion scripts set to work in the studies is advised, to identify the techniques and phrases which make suggestions effective. However this is only possible if the authors publish their full suggestion scripts and protocols. We encourage all researchers to provide such scripts in full lengths, and journals to publish them either as an appendix or an online supplement.

4.6. Declaration of interests

One of the papers (Kekecs, et al., 2012) included in the review is a work of the first and the third authors (ZK and KV).

4.7. Author's Contribution

Z. K.: study design, literature search, data extraction and analysis, and writing up the manuscript

T. N.: study design, data extraction, and writing up the manuscript

K. V.: providing theoretical background and writing up the manuscript

4.8. Acknowledgements

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4.9. Funding and support

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5. Discussion and interpretation

This section interprets the results of the three papers in the dissertation jointly with a wide scope including discussions of strongly related topics which were not analyzed in detail in the articles above.

5.1. Effectiveness and cost-effectiveness:

With the meta-analysis we tested the effectiveness of suggestive interventions in surgical settings. In our clinical study we found that suggestion group patients were calmer and more cooperative in the perioperative period and in the meta-analysis we were able to confirm that these interventions reduce postoperative pain intensity and nausea, and that they might also have an effect on decreasing pain medication requirement and postoperative anxiety, but no overall effect was noted on procedure time.

However having an effect in the expected direction is one thing, and having a clinically significant and cost-effective impact that really benefits patients and hospitals alike is another, and this might just make the difference between a successful intervention and a therapy that might better be left behind.

Although hypnosis seems to be more effective than therapeutic suggestions if we look at the mean pooled effect sizes in the meta-analysis, there were no significant differences noted between the two approaches. It remains to be seen which of these techniques will prove to be the more practical solution. Suggestions are certainly cheaper as they require less training and less time to apply. As a result, they can be utilized in greater quantity. Maybe suggestions

could be a solution for the day-to-day practice while hypnosis could be used for patients with special needs who are exceptionally vulnerable for anxiety.

To make these kinds of decisions, the analyses of economical value and clinical significance (Jacobson & Truax, 1991) have to be included in the studies to determine the practical relevance of the interventions, information which is important for the management and shareholders of hospitals and for decision makers in politics. There are already some great studies reporting cost analyses (Disbrow, et al., 1993; Lang, et al., 2006; Lang & Rosen, 2002), but analysis of clinical relevance is rare.

We can interpret some of our results according to Cohen's (1988) classical criterion. (This is not to imply, that effect size or the "small", "medium", "large" effect grading system would be identical to clinical significance (Durlak, 2009)). In our eye surgery study we managed to decrease heart rate during surgery in the suggestion group by approximately 5 beats per second compared to the control group ($g = 0.50$) which does not hold too great of a clinical relevance, nevertheless it is categorized to be a medium sized effect according to Cohen's classical criterion (effect sizes converted from Cohen's d reported in the paper to adjusted Hedges' g). The pooled effect size of therapeutic suggestions for the decrease of pain intensity and nausea is $g = 0.16$ (95%CI = 0.03, 0.29) and $g = 0.15$ (95%CI = 0.05, 0.24) respectively which are small by Cohen's standards (note that this pooled effect size contains suggestions presented to anesthetized patients as well, which turned out to be less effective than conscious presentation).

Overall we have to find a way to improve the effectiveness of therapeutic suggestion interventions and this is only possible with more methodically correct and well reported studies focused on the moderators of the effects which include the assessment of clinical

relevance and/or cost-effectiveness as well as the full length suggestion scripts applied in the studies.

5.2. Possible background mechanisms

In this section I would like to supplement the content of the papers with an overview about theories on the mechanisms underlying suggestive effects.

5.2.1. Stress reduction

One of the possible effective component of suggestive interventions can be stress reduction, which can be attributed to many factors in a common therapeutic suggestion protocol, like human contact, reassurance by the suggestions, distraction and also relaxation (see also 5.2.2.).

As stated above, perioperative stress and anxiety has a really high prevalence (Jafar & Khan, 2009; Janis, 1958) and it can assert a wide variety of unfavorable effects on the course and outcome of the operation including but not limited to reduced subjective wellbeing, elevated blood pressure and heart rate, increased medication consumption (analgesics, anesthetic agents, anti-emetics, anxyolitics etc.), higher pain scores, slower wound healing, increased length of hospital stay, lower satisfaction with the operation, and higher chance of developing chronic pain symptoms post-operatively (e.g. (Broadbent, et al., 2003; George & Scott, 1982; Munafò & Stevenson, 2001)). It is plain that if we “only” relieve operation related stress, we already did a lot in improving the surgical procedure.

Consistently, if we compare the evidence based beneficial effects of psychological interventions around medical procedures, like lower pain intensity, pain medication intake,

length of hospital stay; reduced costs; improved recovery, physiological indices and satisfaction (Casida & Lemanski, 2010; Devine, 1992; Flory, et al., 2007; Hathaway, 1986; Johnston & Vögele, 1993; Montgomery, et al., 2002; Schnur, et al., 2008; Tefikow, et al., 2013), we find that these benefits are curiously aligned with the areas of effects of anxiety. This indicates that the reduction of anxiety could be at least one of the mediators of the benefits of any psychological technique used perioperatively.

Based on our results presented in the dissertation, it seems that hypnosis and therapeutic suggestions are good techniques for reducing procedural stress. Therefore it seems well founded to hypothesize that suggestive methods also assert their effects partly through stress reduction, although to confirm this, statistical analysis of mediation is needed for example by using Sobel's test (Sobel, 1982) or Bootstrapping (Preacher & Hayes, 2004).

5.2.1.1. Stress in the medical staff, a side-note

Although the dissertation focuses on relieving anxiety and procedure related side effects for patients, we have to acknowledge that the medical staff also experiences stress. For example the results of Molassiotis, van den Akker and Boughton (1995) indicate that in a bone marrow transplantation clinic 50% of the medical staff were emotionally exhausted, and more than 10% showed clinical levels of anxiety. Sources of stress were identified to be regular work with dying patients, excessive responsibility, rapid advances in technology, and excessive personal demands of patients and families. Another study showed that main causes of stress for nurses in surgery and intensive care wards are work load, the feeling that they are unprepared to meet the emotional demands of patients and their families, and death and dying (Gray-Toft & Anderson, 1981). The impact of these stressors is also assessed by a number of studies. These studies conclude that stress impairs both technical and non-technical skills, especially in younger doctors; it can lead to medical errors, physical and mental health

problems, or even suicide (Arora et al., 2010; Bittner, Khan, Babu, & Hamed, 2011; Song, Tokuda, Nakayama, Sato, & Hattori, 2009). Consequently it is fundamental to recognize anxiety and distress and signs of burnout early on, and to promote adaptive coping strategies, stress management techniques and a healthy work-life balance.

There are several anecdotal accounts indicating that being trained in the application of suggestive techniques is not only beneficial for the patient, but also for the doctors themselves, who report better general wellbeing and lower work-associated stress levels (Gyulaházi, 2011; Szegvári, 2011; Szigecsán, 2011). Another good point in favor of suggestions used in medicine.

5.2.2. Relaxation

Relaxation has well documented beneficial effects on both psychological and physiological indices when used around surgical procedures, for instance reduced anxiety and reported pain intensity, enhanced wound healing, increased global health scores, decreased fatigue, lower respiration rate, heart rate and blood pressure (Broadbent et al., 2012; Dimeo, Thomas, Raabe-Menssen, Pröpper, & Mathias, 2004; Good et al., 2010; Kahokehr, Broadbent, Wheeler, Sammour, & Hill, 2012; Ko & Lin, 2012). Increased immune functionality is also demonstrated in response to relaxation interventions (Van Rood, Bogaards, Goulmy, & Van Houwelingen, 1993). Suggestion techniques often involve some kind of relaxation component, for example most of the hypnosis techniques aim to bring the patient to a deeply relaxed state during hypnotic induction. Our intervention with cataract surgery patients also contained relaxation techniques. Thus relaxation can be another effective component of suggestion interventions, which of course goes hand-in-hand with stress reduction, meaning that these phenomena cannot be entirely separated.

5.2.3. Priming

The above mentioned mechanisms (stress reduction and relaxation) can undoubtedly carry a mayor part of the effect of suggestion methods but these factors can be considered as a part of almost any psychological intervention. The unique component of suggestions can rather be explained using the terminology of priming (e.g. (Rossi & Rossi, 2007))

Priming is a part of our implicit memory, during which the exposure and processing of a stimulus influences a response to a later stimulus (Kihlstrom, Dorfman, & Park, 2007). Priming can be either positive or negative. In positive priming the prime facilitates processing of the target, while in negative priming, the prime inhibits processing of the target. This is an involuntary effect which is also one of the key features of suggestions.
In a simple case of repetition priming, a positively primed word is processed faster, and is "produced" spontaneously more often. For example if a patient hears "you feel comfortable and relaxed", they will use these words more readily to later describe their own feelings. In semantic priming not only the originally presented item, but words associated to it are also primed. So the patient will not only use "comfortable" more often if we ask her to describe her feelings, but there is also a bigger chance for that she will use "at ease" or some other synonym. Primed content are processed more easily, meaning that priming concepts of calmness and happiness might help for the patient to interpret her feelings and stimuli coming from the outside more positively. This way a patient primed to perceive pain and frustration is more likely to interpret the manipulation of the dentist as painful as a patient who is primed for feelings of cold or pressure.

We can also interpret semantic priming in a much broader sense. A growing body of empirical evidence suggests an overlap between motor coding of action and the semantic

representation of words denoting action. This phenomenon is also referred to as motor resonance during language comprehension. See Fischer and Zwaan (2008) for a review of this literature. The overlap basically means that during the semantic analysis of a sentence involving hand movement, brain areas associated with hand movement in the motor region are also activated. These studies also show that motor action interferes with semantic processing of action words in a systematic way implying that these motor areas are inherent components of language processing.

The close association of motor and language areas can serve as a good explanation for concepts in the suggestion literature like the ideomotor phenomenon, Chevreul's Pendulum, arm levitation, etc.; but it can be generalized as well, to account for a broader range of suggestive effects. For example it is possible that similar long distance neural connections are responsible for some of the physiological, endocrine and immune changes elicited by suggestions.

5.2.4. Protection against negative suggestions

In addition to the above mentioned mechanisms, positive suggestions can also act as a protective factor against negative ones. Reports suggest that negatively-loaded statements of medical personnel can be just as influential as positive suggestions, but in the opposite direction (Lang et al., 2005; Varga & Diószeghy, 2001). Unfortunately, patients are exposed to a great number of negative suggestions during medical procedures, received from concerned relatives, overworked doctors and nurses and poorly constructed or localized information brochures and posters. Positive suggestion techniques are not only capable to elicit favorable outcomes that cancel the negative effects, but with patient-education it is also possible to protect against negative suggestions, for example by raising awareness of their existence (Varga & Diószeghy, 2001).

5.2.5. Motivation for healing

Motivational factors can be just as important in coping with medical problems as in performance in everyday life or sports. For example mobilization and participation in rehabilitation are indicators of successful surgical recovery in several procedures. Additionally, willingness to follow through with treatment regimes even if they are unpleasant is really important, especially in chronic illnesses. The motivational aspect is also positively influenced by suggestions as demonstrated by several studies. For example Cowan and colleges (2001) reported that patients getting positive suggestions needed less encouragement from the nurses to perform specific tasks following bariatric surgery. Further, Edelson and Fitzpatrick (1989) showed that as a result of a hypnosis intervention the amount of active hours (standing, walking) increased significantly in patients suffering from chronic pain.

5.2.6. Theories on the additional effects of hypnosis

In addition to the suggestive element, theorists argue that hypnosis has several suggestion-independent healing effects as well. For example Gruzelier (1998) points out that positive effects of hypnosis may be attributed to the shift in the electro-cortical balance of the two brain hemispheres; Hilgard (1991) emphasizes the importance of dissociation in the background of the healing effects; while Bányai (1991) argues that the adaptive strength of hypnosis-like techniques is that the hypnotist and subject can safely engage in such an intensive interaction that can be a model of intimate interpersonal relationships.

5.3. Reporting and analysis of suggestion scripts and protocols

A yet poorly studied area which might result in considerable improvement in efficiency is the thorough analysis of suggestion scripts and protocols.

If we truly believe that the effective component of suggestive interventions are suggestions carried by words, we might as well ought to be looking at the exact words and phrasing used in the individual studies and the timing and method of transferring the suggestions. Although this topic is rarely investigated, there are still a number of related studies.

5.3.1. Affirmative and non-affirmative suggestions

Some researchers are looking at the difference in effectiveness of affirmative compared to non-affirmative suggestions (see for example: (Jelicic, Bonke, & Millar, 1993a)). An example of an affirmative suggestion is: “you will feel calm and comfortable”, whereas a non-affirmative suggestion looks like this: “you will feel no anxiety and no discomfort”. In theory, non-affirmative suggestions should be less effective as they carry a word with negative meaning which in turn may prime associated negative mental content. So far there is not sufficient evidence to support this claim.

In the subliminal priming literature it is already demonstrated that “two word sentences” (eg. “hero wins”; “hero fails”; “enemy fails”; “enemy wins”)(Greenwald & Liu, 1985) assert their priming effect as if they were single words, and they are not processed as a sentence even if presented for 210 milliseconds which allows the conscious detection of the primes. This evidence validates the concerns that non-affirmative suggestions (eg. “no pain”) could prime in an unfavorable direction if the patient gets the suggestions under general anesthesia (when semantic processing is impaired). However it is still unclear, if this could also be true if the patient is awake and aware. Some may argue that in these circumstances the altered state of consciousness of the patient, stress, fear and emotional strain may well be enough to account for diminished or biased detection and weakened semantic processing (Varga, 1998).

These assumptions could be put to the test with the following study design. Two suggestion scripts should be devised: one containing only affirmative, the other only non-affirmative

suggestions. Patients enlisted for an operation performed using general anesthesia should be allocated to one of 5 groups. The four experimental groups would get one of the suggestion scripts containing affirmative or non-affirmative suggestions either immediately before or immediately after anesthesia is induced. The control groups should get regular treatment only with a blank tape played at the start of general anesthesia. If perception and semantic processing is not impaired by the presurgical circumstances, affirmative and non-affirmative suggestions should show similar effectiveness in the awake groups, while affirmative suggestions should yield better results under general anesthesia compared to non-affirmative ones. On the other hand if the presurgical altered state of consciousness of the patient does play a debilitating or perception impairing role, non-affirmative suggestions should be less effective even in the awake group. The control group is there to confirm that there is indeed an effect and to serve as a baseline so that the "direction" of the effect can be determined.

5.3.2. General or specific suggestions

Other researchers are interested if there is a difference in specific and general suggestions. For example Gruzelier and colleges (2001) compared the effectiveness of two self-hypnosis interventions for university students in the exam period (in this period the decline of immune functions is repeatedly demonstrated due to prolonged stress). The specific suggestion group had to imagine that sharks or dolphins devour germ cells in their blood stream, while the relaxation suggestion group got instructions of peace, happiness and tranquility. The group getting immune related suggestion had fewer viral illnesses and their lymphocyte count decreased in a slower pace compared to the relaxation suggestion group. This finding suggests that specific suggestions (for example: "your stomach will pump and gurgle, and you will become very hungry soon after the operation." (Disbrow, et al., 1993); pp. 489) may be more

effective than general ones unrelated to the expected outcome (for example: “Everything is going very well, we're very pleased with your progress" (McLintock, et al., 1990b); pp. 788). Accordingly, recent findings of Benczúr (2012) point out that the length of mechanical ventilation of patients treated at the intensive care unit was inversely related to the proportion of suggestions patients received concerning the ventilation itself.

An interesting addition to this topic is the case report of Ewin (2005) quoted by Benczúr (2012). Ewin reports that when working with burn patients he used to give suggestions for every affected body part and skin area specifically to be cool and pleasant. However one time he did not notice a burned area on the shoulder. This became apparent, when all of the skin areas of the patient that were mentioned accompanied by positive suggestions started to heal nicely, while skin transplantation had to be performed on the shoulder. Although this is only an anecdote, it nevertheless further illustrates the ways in which the content of suggestive messages may influence effectiveness.

5.3.3. When, for how long and how many times?

There is surprisingly little data on the three questions: When should we apply the suggestions to the patients? For how long should the suggestions and the intervention last? How many times should the interventions (or individual suggestions) be repeated? For example Bennet, DeMorris and Willits (1988) who applied taped verbal suggestions during general anesthesia concluded that there was no correlation between the time of suggestion presentation within the anesthesia regimen and the studied outcome variables, although this only signifies that progression of anesthesia has no effect on the effectiveness of suggestions. Another finding with respect to timing comes from Benczúr (2012), who reports that the earlier the patient started to receive the suggestive intervention from getting into the ICU, the shorter her hospital stay and duration of mechanical ventilation was. Benczúr also notes that the sheer

number of interventions applied for one patient did not correspond with better outcome, but as stated above the proportion of suggestive information regarding the ventilation itself was of importance. In our cataract surgery study we did find an association between the times of listening to the intervention audio and preoperative indicators of anxiety and wellbeing (see table 5 in section 3.4.3.), but there was no correlation with the other outcome variables, and if we apply correction for the number of comparisons, the correlation becomes statistically non-significant.

Although at the moment there is not enough data on the effects of the content and time components of suggestive protocols, this should change with the proper reporting of full suggestions scripts and protocols and also with targeted research in these areas.

5.4. Control conditions

In areas of medicine, where a therapy is already regularly used to treat a condition, studies usually measure the effectiveness of a new technique compared to an already established other treatment. This is not only so for ethical reasons, but also to find out if the new technique is sufficiently effective to replace or substitute the old one.

As mentioned before, in spite of the large variety of psychological and alternative stress management techniques available, the only really regularly used anxiety-control tool for surgical procedures is anxiolytic premendication. In fact at the surgery ward where the cataract surgery study was performed premedication with anxiety pills are given standardly for every patient before surgery. For ethical reasons we did not deprive the suggestion group subjects of the anti-anxiety premedication, which means that we actually tested the effectiveness of suggestion-based psycho-education intervention plus xanax compared to

xanax alone. Since other techniques are rarely applied in ophthalmic surgery, no complementary therapies were used in the control condition in the cataract study.

For similar reasons, the effectiveness of suggestions was compared to “regular treatment” controls in the meta-analysis as well. None of the previous meta-analyses showed significant difference between “regular treatment” and “attention” control conditions (Montgomery, et al., 2002; Schnur, et al., 2008) so these were treated as equivalents in our study. An interesting direction for future research would be to compare the effectiveness of suggestive interventions with different psychological or other complementary techniques.

Comparing a group that gets intervention to a group that gets none in a single blind design can be biased by the expectancy effect. These effects can be tackled by using, placebo or “minimally effective” control conditions (Jensen & Patterson, 2005), but the number of studies using these kinds of control conditions is still minute, which made it unfeasible to test for expectancy effects in the meta-analysis. This is also a shortcoming of the cataract surgery study, although in this study regular treatment involved anxiolytic premedication, which could have elicited anxiety reduction expectancies in the control group as well. Nevertheless we have to keep in mind during the interpretation of the results of both studies, that our conclusions about effectiveness are valid for the suggestive intervention together with subject-expectancy rather than for the intervention alone.

5.5. Additional moderating factors

In the discussion of the first article we have concluded that an intervention which is adapted to the individual patients seem to yield better results than one that is fully standardized. At first, the results of the meta-analysis may appear to contradict this assumption, because it did not support the claim that live techniques would be better compared to recordings. Although recordings may be more rigid than a live therapy in a real-life situation, this versatility of live

interventions, usually cannot be fully integrated into an empirical study. Even though the therapist is present in person in these studies, they usually have to follow a standardized protocol in some cases word-for-word. Further, recordings may not be as rigid as they seem to be. For example in the study of Disbrow, Bennett and Owings (1993), simple editing work on the tapes made them personally relevant for the patient. In addition, techniques can leave ample room for the patient to “fill in the gaps” with personal information. Like in the commonly used guided imagery, the safe place technique - also used in our cataract surgery study - patients can take refuge during unpleasant medical procedures in an imaginative place of their own choosing. Consequently, we need more evidence to determine the moderating effect of personalization in suggestive techniques.

Some of the studies in the literature control for the effects of hypnotizability, suggestibility or absorption, and the experience level of the surgeon performing the procedure. Although these factors were not controlled for in the meta-analysis (because just a few study reported such information) and only surgeon experience was controlled in the cataract surgery study (the same surgeon performed all operations), they were shown to be non-influential on the effectiveness of hypnosis intervention by recent systematic reviews (Schnur, et al., 2008; Tefikow, et al., 2013).

5.6. Final remarks

The dissertation identified the medical areas where the effects of therapeutic suggestions are empirically evaluated, investigated the effectiveness of suggestions in outpatient cataract surgery, and assessed the impact of suggestive interventions (both therapeutic suggestions and hypnosis) used in the perioperative period.

Based on our results we can conclude that the effectiveness of suggestions has been already appraised in several medical areas and most of the studies found significant benefits for the intervention (although correction techniques are rarely used to control for the number of comparisons). The study with cataract surgery patients indicated that a complex psycho-educational intervention enhanced with suggestive techniques can counteract procedural anxiety. Furthermore, our meta-analysis also seemed to confirm the beneficial effects of suggestions in surgery in areas which are associated with perioperative anxiety (although postoperative anxiety itself was not found to be significantly lower). This analysis deepened our understanding of moderating effects of different suggestion presentation methods as well. In summary we can conclude that at the moment suggestions are versatile but moderately effective tools in combating stress related to medical procedures and in improving associated outcomes, and that further research is needed to identify new areas of application and to improve effectiveness.

5.7. Acknowledgements

In addition to the acknowledgements presented at the end of each paper, I would like to give a shout-out for people who made the completion of this dissertation not only possible but also enjoyable.

I would like to thank my supervisor, Dr. Katalin Varga for the invaluable counsel and aid she provided throughout my doctoral studies and would also like to express my gratitude towards the co-authors of the papers presented in the dissertation: Dr. Katalin Varga, Dr. Edit Jakubovits, Dr. Katalin Gombos, and Tamás Nagy for their great help in conducting the studies and preparing the manuscripts. I am grateful to the head of the Behavioral Psychology Doctoral Program, Dr. Éva Bányai, and to all the colleges in the Department of Affective

Psychology as well who provided an inspiring and at the same time demanding environment in which new approaches and ideas were always welcomed. Furthermore, the final version of the dissertation was prepared based on the outstanding comments of dr. Balázs Aczél and dr. Lilla Benczúr as opponents and the audience at the departmental (home) defense of the dissertation. And finally I am forever indebted to my wonderful partner Orsolya Réka Kiss for her inspiration, motivation and unconditional love.

Appendices

Appendix A. PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	71
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	72
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	73-74
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	74
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	review protocol not published
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	76
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	76
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix B
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	80
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	77
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	77

Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	77-78
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	78
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	78-79
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	87
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	78-79
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	80 and fig. 3
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	table 7.
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	table 7.
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	fig. 9-13
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	table 8 and table 10-14
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	fig. 4-8
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	table 9 and fig. 14-17
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	103-105
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	105
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	103-106
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	107

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic

Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097
For more information, visit: **www.prisma-statement.org**.

Appendix B. Search terms and operators

Pubmed search terms:

1. ((hypnosis[Title/Abstract]) OR (hypnotic[Title/Abstract]) OR (hypnotherapy[Title/Abstract]) OR (hypnotically[Title/Abstract] OR (hypnotize[Title/Abstract])) AND ((surgery[Title/Abstract]) OR (surgical[Title/Abstract]) OR (operation[Title/Abstract]) OR (operative[Title/Abstract]) OR (postoperative[Title/Abstract]) OR (preoperative[Title/Abstract]) OR (perioperative[Title/Abstract])) AND (("1980"[Date - Publication] : "2012/08"[Date - Publication]))

2. ((suggestion[Title]) OR (suggestions[Title]) OR (suggestive[Title]) OR (suggestion group[Title/Abstract]) OR (communication training[Title/Abstract]) OR (communication technique[Title/Abstract]) OR (communication intervention[Title/Abstract]) OR (positive communication[Title/Abstract]) OR (psychological intervention[Title/Abstract]) OR (psychological preparation[Title/Abstract]) OR (psychological technique[Title/Abstract]) OR (intraoperative suggestion*[Title/Abstract]) OR (perioperative suggestion*[Title/Abstract]) OR (preoperative suggestion*[Title/Abstract]) OR (postoperative suggestion[Title/Abstract]) OR (postoperative suggestions[Title/Abstract]) OR (operative suggestion*[Title/Abstract]) OR (therapeutic suggestion*[Title/Abstract]) OR (positive suggestion*[Title/Abstract]) OR ((suggestion*[Title/Abstract]) AND ((tape*[Title/Abstract]) OR (recording[Title/Abstract]) OR (recorded[Title/Abstract])))) AND ((surgery[Title/Abstract]) OR (surgical[Title/Abstract]) OR (operation[Title/Abstract]) OR (operative[Title/Abstract]) OR (postoperative[Title/Abstract]) OR (preoperative[Title/Abstract]) OR (perioperative[Title/Abstract])) AND (("1980"[Date - Publication] : "2012/08"[Date - Publication]))

CINAHL search terms (only viewing studies from 1980 on):

1. (AB Hypnosis OR AB Hypnotic OR AB Hypnotherapy OR AB hypnotically OR AB hypnotize OR TI Hypnosis OR TI Hypnotic OR TI Hypnotherapy OR TI hypnotically OR TI hypnotize) AND (AB Surgery OR AB surgical OR AB Operation OR AB operative OR AB postoperative OR AB preoperative OR AB perioperative OR TI Surgery OR TI surgical OR TI Operation OR TI operative OR TI postoperative OR TI preoperative OR TI perioperative)

2. (TI Suggestion OR TI suggestions OR TI suggestive OR TI suggestion group OR AB suggestion group OR TI communication training OR AB communication training OR TI communication technique OR AB communication technique OR TI communication intervention OR AB communication intervention OR TI positive communication OR AB positive communication OR TI psychological intervention OR AB psychological intervention OR TI psychological preparation OR AB psychological preparation OR TI psychological technique OR AB psychological technique OR TI intraoperative suggestion* OR AB intraoperative suggestion* OR TI perioperative suggestion* OR AB perioperative suggestion* OR TI preoperative suggestion* OR AB preoperative suggestion* OR TI postoperative suggestion OR TI postoperative suggestions OR AB postoperative suggestion OR AB postoperative suggestions OR TI operative suggestion* OR TI therapeutic suggestion* OR TI positive suggestion* OR AB operative suggestion* OR AB therapeutic suggestion* OR AB positive suggestion* OR (TI suggestion* AND (TI tape* OR TI recording OR TI recorded)) OR (AB suggestion* AND (AB tape* OR AB recording OR AB recorded))) AND (AB Surgery OR AB surgical OR AB Operation OR AB operative OR AB postoperative OR AB preoperative OR AB perioperative OR TI Surgery OR TI surgical OR TI Operation OR TI operative OR TI postoperative OR TI preoperative OR TI perioperative)

PsycINFO search terms (only viewing studies from 1980 on):

1. (KW=hypnosis or KW=hypnotic or KW=hypnotherapy or KW=hypnotically or KW=hypnotize or TI=hypnosis or TI=hypnotic or TI=hypnotherapy or TI=hypnotically or TI=hypnotize or AB=hypnosis or AB=hypnotic or AB=hypnotherapy or AB=hypnotically or AB=hypnotize) and (KW=Surgery OR KW=Surgical OR KW=Operation OR KW=operative OR KW=postoperative OR KW=preoperative OR KW=perioperative OR AB=Surgery OR AB=Surgical OR AB=Operation OR AB=operative OR AB=postoperative OR AB=preoperative OR AB=perioperative OR TI=Surgery OR TI=Surgical OR TI=Operation OR TI=operative OR TI=postoperative OR TI=preoperative OR TI=perioperative)

2. (TI=suggestion OR TI=suggestions OR TI=suggestive OR KW=suggestion OR KW=suggestions OR KW=suggestive OR AB=”suggestion group” OR AB=”communication training” OR AB=”communication technique” OR AB=”communication intervention” OR AB=”positive communication” OR AB=”psychological intervention” OR AB=”psychological preparation” OR AB=”psychological technique” OR AB=intraoperative suggestion* OR AB=perioperative suggestion* OR AB=preoperative suggestion* OR AB=”postoperative suggestion” OR AB=”postoperative suggestions” OR AB=operative suggestion* OR AB=therapeutic suggestion* OR AB=positive suggestion* OR TI=”suggestion group” OR TI=”communication training” OR TI=”communication technique” OR TI=”communication intervention” OR TI=”positive communication” OR TI=”psychological intervention” OR TI=”psychological preparation” OR TI=”psychological technique” OR TI=intraoperative suggestion* OR TI=perioperative suggestion* OR TI=preoperative suggestion* OR TI=postoperative suggestion OR TI=postoperative suggestions OR TI=operative suggestion* OR TI=therapeutic suggestion* OR TI=positive suggestion* OR KW=”suggestion group” OR KW=”communication training” OR KW=”communication technique” OR

KW=”communication intervention” OR KW=”positive communication” OR KW=”psychological intervention” OR KW=”psychological preparation” OR KW=”psychological technique” OR KW=intraoperative suggestion* OR KW=perioperative suggestion* OR KW=preoperative suggestion* OR KW=”postoperative suggestion” OR KW=”postoperative suggestions” OR KW=operative suggestion* OR KW=therapeutic suggestion* OR KW=positive suggestion* OR (AB=suggestion* AND (AB=tape* OR AB=recording OR AB=recorded)) OR (TI=suggestion* AND (TI=tape* OR TI=recording OR TI=recorded)) OR (KW=suggestion* AND (KW=tape* OR KW=recording OR KW=recorded))) AND (KW=Surgery OR KW=Surgical OR KW=Operation OR KW=operative OR KW=postoperative OR KW=preoperative OR KW=perioperative OR AB=Surgery OR AB=Surgical OR AB=Operation OR AB=operative OR AB=postoperative OR AB=preoperative OR AB=perioperative OR TI=Surgery OR TI=Surgical OR TI=Operation OR TI=operative OR TI=postoperative OR TI=preoperative OR TI=perioperative)

Dissertations and Theses Database search terms:

1. ((Hypnosis) OR (Hypnotic) OR (hypnotherapy) OR (hypnotically) OR (hypnotize)) AND ((Surgery) OR (surgical) OR (Operation) OR (operative) OR (postoperative) OR (preoperative) OR (perioperative)) AND PDN(>12/30/1979)

2. (TITLE(suggestion) OR TITLE(suggestions) OR TITLE(suggestive) OR IF(suggestion) OR IF(suggestions) OR IF(suggestive) OR ABS(suggestion group) OR ABS(communication training) OR ABS(communication technique) OR ABS(communication intervention) OR ABS(positive communication) OR ABS(psychological intervention) OR ABS(psychological preparation) OR ABS(psychological technique) OR ABS(intraoperative suggestion*) OR

ABS(perioperative suggestion*) OR ABS(preoperative suggestion*) OR ABS(postoperative suggestion) OR ABS(postoperative suggestions) OR ABS(operative suggestion*) OR ABS(therapeutic suggestion*) OR ABS(positive suggestion*) OR (ABS(suggestion*) AND (ABS(tape*) OR ABS(recording) OR ABS(recorded)))) AND ((Surgery) OR (surgical) OR (Operation) OR (operative) OR (postoperative) OR (preoperative) OR (perioperative)) AND PDN(>12/30/1979)

3. TITLE(suggestion group) OR TITLE(communication training) OR TITLE(communication technique) OR TITLE(communication intervention) OR ABS(positive communication) OR TITLE(psychological intervention) OR TITLE(psychological preparation) OR TITLE(psychological technique) OR TITLE(intraoperative suggestion*) OR TITLE(perioperative suggestion*) OR TITLE(preoperative suggestion*) OR TITLE(postoperative suggestion) OR TITLE(postoperative suggestions) OR TITLE(operative suggestion*) OR TITLE(therapeutic suggestion*) OR TITLE(positive suggestion*) AND ((Surgery) OR (surgical) OR (Operation) OR (operative) OR (postoperative) OR (preoperative) OR (perioperative)) AND PDN(>12/30/1979)

Appendix C. Outcome measures

Anxiety and distress measures: Taylor Anxiety Scale; State Trait Anxiety Inventory; Mood Adjective Checklist; Visual Analog Scales (VAS); self report on a Likert Scales; Assessment by the nurse on a Likert scale; Gottschalk-Gleser Anxiety Scales; Profile of Mood States tension-anxiety item; Positive and Negative Affect Scale.

Pain intensity measures: self report of intensity or frequency of pain on a Likert Scale, VAS or a Verbal Rating Scale; McGill Pain Inventory.

Pain medication measures: dose of analgesics used; morphine equivalent dose of analgesics used; dichotomous scoring of pain medication (eg. no pain medication required vs. pain medication required; or 3 or less doses of pain medication used vs. more than 3 doses used); frequency of self medication attempts with Patient Controlled Analgesia pump.

Nausea measures: self report of nausea on a Likert Scale, VAS or with a simple yes or no answer to a question like “did you feel nausea after the operation?”; assessment of nurses about nausea on a Likert Scale; number of nausea complaints.

Recovery measures: self report of recovery on a Likert Scale, Verbal Rating Scale or VAS; nurse’s or surgeon’s rating of recovery on a Likert Scale, or a dichotomous assessment like: “better than expected recovery”, “recovery as expected”, or “worse than expected recovery”; Short Form (36) Health Survey (SF-36).

Procedure time measures: duration of the surgery expressed in time units.

Appendix D. Supplementary tables and figures

Table 6. Interpretation of effect size

Effect Size	Percentage of the experimental group who would have better outcome than the average patient in the control group
0.0	50%
0.1	54%
0.2	58%
0.3	62%
0.4	66%
0.5	69%
0.6	73%
0.7	76%
0.8	79%
0.9	82%
1.0	84%
1.2	88%
1.4	92%
1.6	95%

Note: We can interpret standardized mean difference (SMD) effect sizes like Hedges' g according to Cohen (Cohen, 1988) as the percentage of the experimental group which exceeds the lower half of the cases in the control group. Note that in this table positive effect size favors the intervention group.

Table 10. Effect of suggestion on postoperative anxiety

	Mean effect size, Lower and upper bounds and Z test							Heterogeneity test		Moderator effect	
	Mean g	SE	95%CI lower	95%CI upper	z	p	k	I^2	p	χ^2	p
All studies	0.22	0.12	-0.03	0.47	1.82	.083	22	79,92	<.001		
Therapeutic suggestions	0.09	0.15	-0.20	0.37	0.58	.560	16	79.56	<.001	3.44	.064
Hypnosis	0.57	0.19	0.20	0.95	2.99	.003	6	72.93	.003		
Replayed recording	0.12	0.14	-0.16	0.40	0.87	.387	17	79.30	<.001	2.14	.144
Live presentation	0.54	0.22	0.11	0.97	2.46	.014	5	77.26	.001		
Unconscious	-0,01	0.19	-0.38	0.36	0.73	.942	10	79.48	<.001	3.14	.076
Conscious	0.41	0.15	0.11	0.71	2.65	.008	12	78.72	<.001		

Note: positive effect size means less anxiety, therefore a beneficial effect

Table 11. Effect of suggestion on postoperative pain intensity

	Mean effect size, Lower and upper bounds and Z test							Heterogeneity test		Moderator effect	
	Mean g	SE	95%CI lower	95%CI upper	z	p	k	I^2	p	χ^2	p
All studies	0.19	0.07	0.07	0.32	2.95	.003	31	63.33	.001		
Therapeutic suggestions	0.16	0.07	0.03	0.29	2.47	.014	24	35.75	.043	0.87	.352
Hypnosis	0.29	0.18	-0.07	0.64	1.57	.116	7	73.23	.001		
Replayed recording	0.15	0,06	0.03	0.27	2.46	,014	26	31.64	.063	3,76	.097
Live presentation	0.41	0.24	-0.06	0.87	1.70	,089	5	78.03	.001		
Unconscious	0.14	0.07	-0.00	0.28	2.00	.045	22	35.96	.049	1.78	.182
Conscious	0.31	0.14	0.05	0.58	2.28	.022	9	65.30	.003		

Note: positive effect size means less pain, therefore a beneficial effect

Table 12. Effect of suggestion on the amount of postoperative pain medication

	Mean effect size, Lower and upper bounds and Z test							Heterogeneity test		Moderator effect	
	Mean g	SE	95%CI lower	95%CI upper	z	p	k	I^2	p	χ^2	p
All studies	0.12	0.07	-0.02	0.26	1.73	.084	33	54.34	<.001		
Therapeutic suggestions	0.08	0.06	-0.04	0.20	1.32	.188	27	29.65	.075	1.09	.297
Hypnosis	0.23	0.30	-0.35	0.81	0.78	.438	6	83.19	<.001		
Replayed recording	0.16	0.08	0.01	0.31	2.08	.037	29	55.41	<.001	2,05	.152
Live presentation	-0.14	0.19	-0.50	0.23	0.73	.465	4	47.55	.126		
Unconscious	0,09	0.08	-0.07	0.24	1.11	.269	21	43.50	.018	0.43	.514
Conscious	0.18	0.15	-0.11	0.46	1.22	.222	12	66.08	.001		

Note: positive effect size means less analgesic requirement, therefore a beneficial effect

Table 13. Effect of suggestion on postoperative nausea

	Mean effect size, Lower and upper bounds and Z test							Heterogeneity test		Moderator effect	
	Mean g	SE	95%CI lower	95%CI upper	z	p	k	I^2	p	χ^2	p
All studies	0.22	0.07	0.09	0.35	3.32	.001	27	47.84	.003		
Therapeutic suggestions	0.15	0.05	0.05	0.24	3.03	0.002	25	0	.527		
Hypnosis[a]											
Replayed recording	0.16	0.06	0.05	0.27	2.91	0.004	25	14.80	.253		
Live presentation[a]											
Unconscious	0.14	0.06	0.04	0.25	2.59	,010	22	3.18	,417	4.19	.041
Conscious	0.45	0,19	0.07	0.83	2.30	,021	5	78.27	,001		

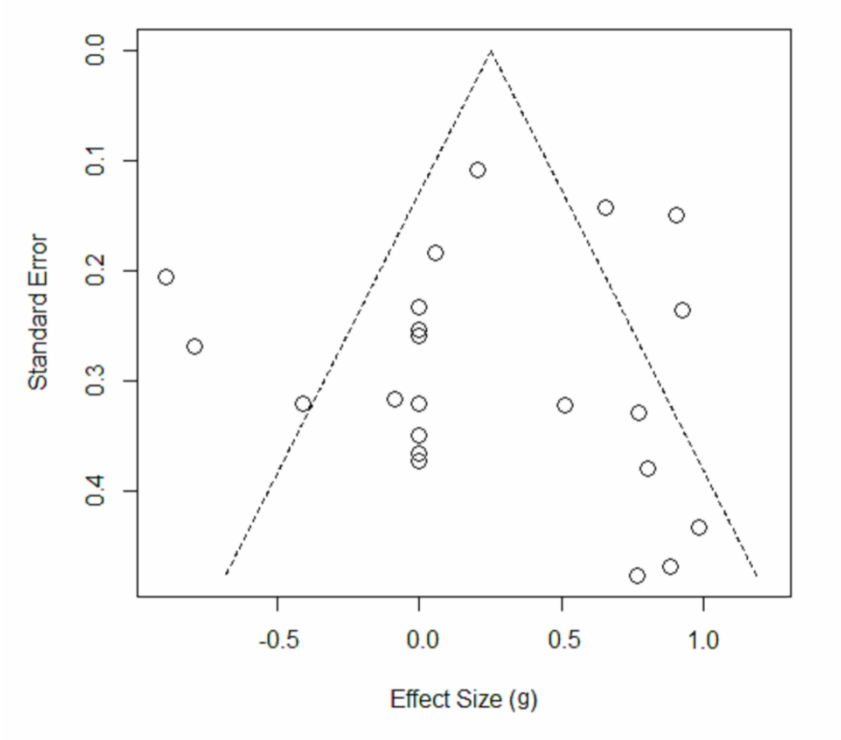
Note: positive effect size means less nausea, therefore a beneficial effect; [a] - fewer than four studies used hypnosis and live presentation, thus meta analyses of the effect of these moderators and moderator comparisons with therapeutic suggestions and live presentation were not performed.

Table 14. Effect of suggestion on procedure time

	Mean effect size, Lower and upper bounds and Z test							Heterogeneity test	
	Mean g	SE	95%CI lower	95%CI upper	z	p	k	I^2	p
All studies	0.10	0.08	0.26	-0.06	1.25	.213	13	39.64	.069

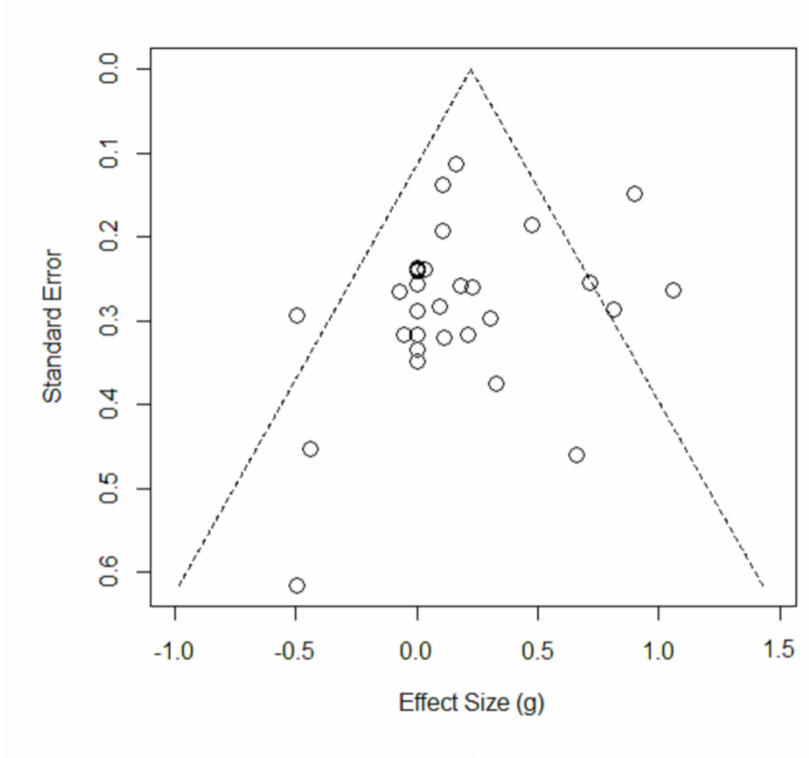
Note: positive effect size means shorter procedure time; because of the low number of studies and clustering of the moderator conditions the moderators for procedure time were not individually analyzed (see also the outcome selection section)

Figure 4. Funnel plot of the anxiety data-set



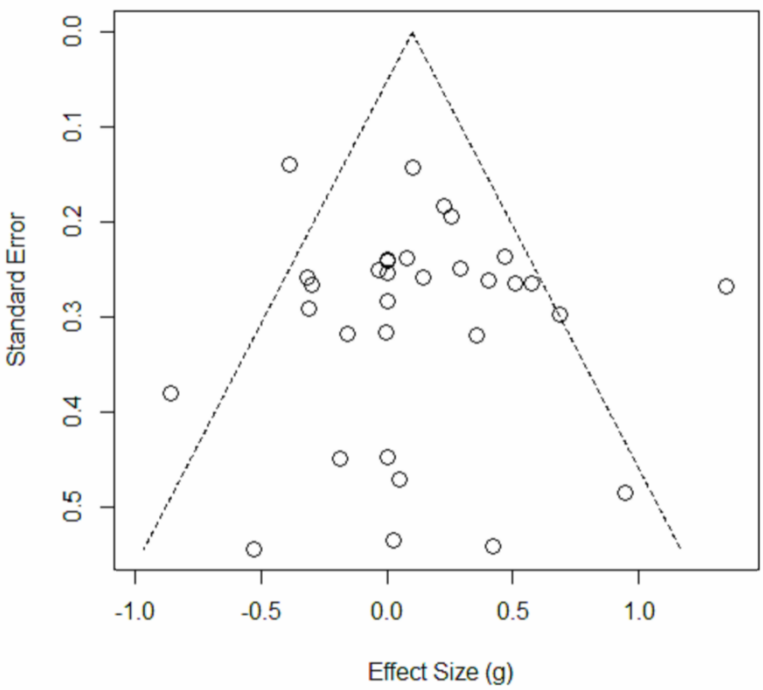
Funnel plot of the effect size from each study (expressed as corrected Hedges g (g)) against the Standard Error of the effect size. The formal testing for publication bias using Begg and Mazumdar's rank correlation did not indicate bias: τ_B = -.20 p = .185.

Figure 5. Funnel plot of the pain intensity data-set



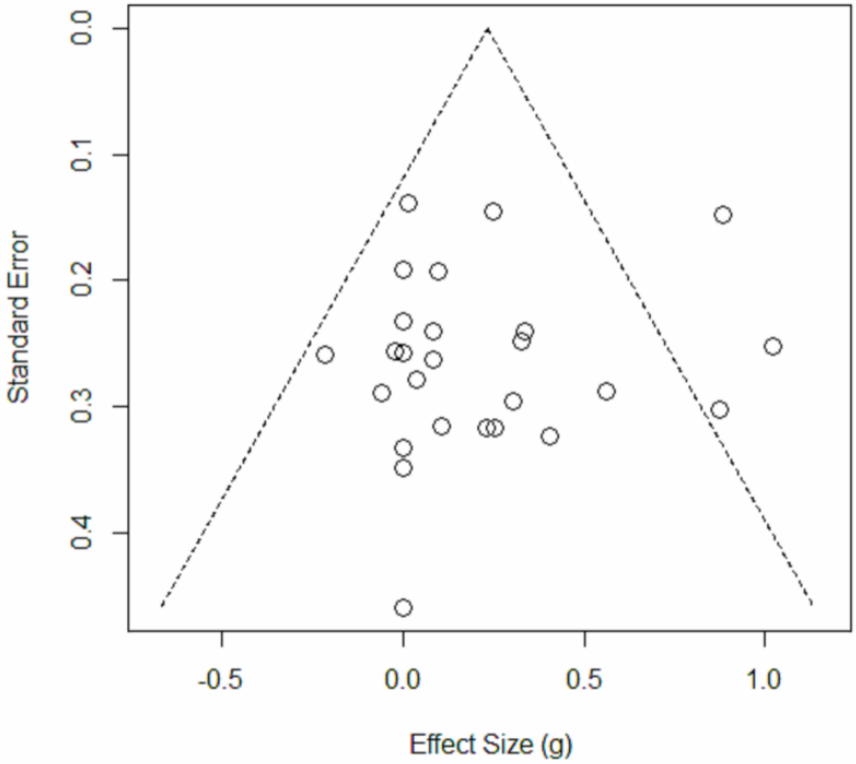
Funnel plot of the effect size from each study (expressed as corrected Hedges g (g)) against the Standard Error of the effect size. The formal testing for publication bias using Begg and Mazumdar's rank correlation did not indicate bias: $\tau_B = .08$ $p = .552$.

Figure 6. Funnel plot of the pain medication data-set



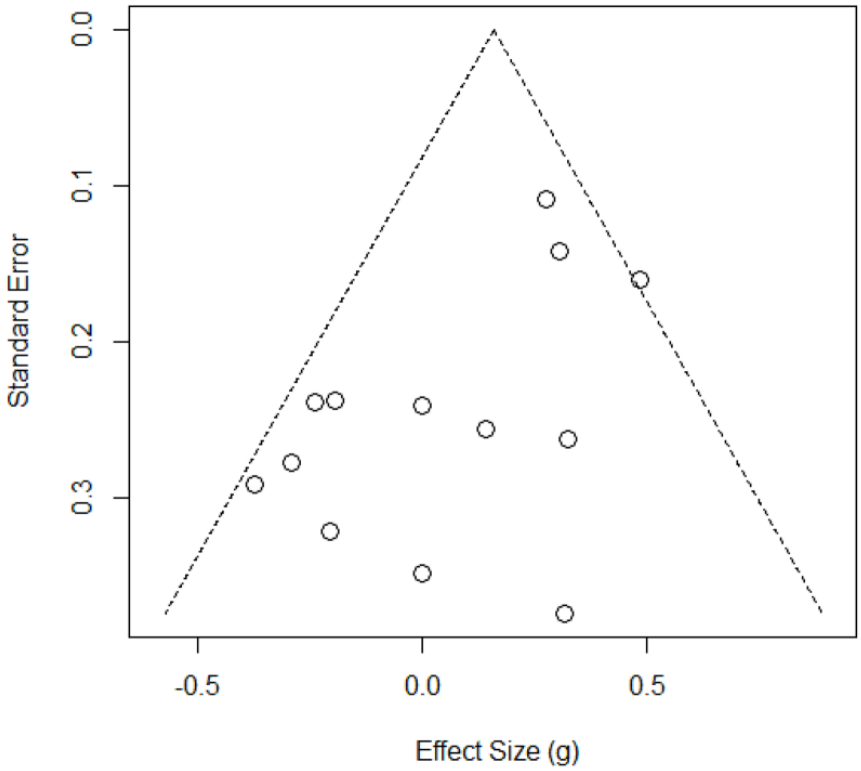
Funnel plot of the effect size from each study (expressed as corrected Hedges g (g)) against the Standard Error of the effect size. The formal testing for publication bias using Begg and Mazumdar's rank correlation did not indicate bias: τ_B = -.03 p = .804.

Figure 7. Funnel plot of the nausea data-set



Funnel plot of the effect size from each study (expressed as corrected Hedges g (g)) against the Standard Error of the effect size. The formal testing for publication bias using Begg and Mazumdar's rank correlation did not indicate bias: τ_B = -.07 p = .617.

Figure 8. Funnel plot of the procedure time data-set



Funnel plot of the effect size from each study (expressed as corrected Hedges g (g)) against the Standard Error of the effect size. The formal testing for publication bias using Begg and Mazumdar's rank correlation did not indicate bias: τ_B = -.23 p = .272.

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