Systematic Review of the Efficacy of Pre-surgical Mind-Body Based Therapies on Post-operative Outcome Measures

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Summary

Objectives: A large body of research has demonstrated that patient factors are strong predictors of recovery from surgery. Mind-body therapies are increasingly targeted at pre-operative psychological factors. The objective of this paper was to evaluate the efficacy of pre-operative mind-body based interventions on post-operative outcome measures amongst elective surgical patients.

Methods: A systematic review of the published literature was conducted using the electronic databases MEDLINE, CINAHL and PsychINFO. Randomised controlled trials (RCTs) with a prospective before-after surgery design were included.

Results: Twenty studies involving 1,297 patients were included. Mind-body therapies were categorised into relaxation, guided imagery and hypnotic interventions. The majority of studies did not adequately account for the risk of bias thus undermining the quality of the evidence. Relaxation was assessed in 8 studies, with partial support for improvements in psychological well-being measures, and a lack of evidence for beneficial effects for analgesic intake and length of hospital stay. Guided imagery was examined in 8 studies, with strong evidence for improvements in psychological well-being measures and moderate support for the efficacy of reducing analgesic intake. Hypnosis was investigated in four studies, with partial support for improvements in psychological well-being measures. Evidence for the effect of mind-body therapies on physiological indices was limited, with minimal effects on vital signs, and inconsistent changes in endocrine measures reported.

Conclusions: This review demonstrated that the quality of evidence for the efficacy of mind-body therapies for improving post-surgical outcomes is limited. Recommendations have been made for future RCTs.

Keywords:

Mind-body therapies; Post-operative outcomes; Surgery.

Introduction

As the demand for surgical procedures continue to increase with an expanding and aging population, so does the number and range of surgical procedures[1, 2]. In a report assessing the global rate of surgery, it was estimated that 234.2 million surgical procedures are performed each year [3]. Elective surgery typically entails a planned, non-emergency surgical procedure that can be delayed for at least 24-hours; common examples include hip and knee replacement and coronary artery bypass graft. Although the primary component of surgery involves some type of physical intervention or manipulation, research demonstrates that non-physical pre-operative patient factors (e.g., psychological state, personality factors) are strong predictors of patient recovery from surgery [4, 5]. In some cases, such factors have been shown to be stronger predictors of outcomes after surgery than the surgical procedure itself [6].

Several mechanisms underlying the relationship between negative psychological states and surgical recovery have been proposed, including: activation of the body's major physiological responses to stress [7]; the impact of patient behaviour that is likely to influence pain and recovery (e.g., obesity, smoking, alcohol intake [7, 8]); and a direct influence on increased pain perception by negative psychological states [9]. This field of research where psychology (mind) influences the immune (body) has led to the development of mind-body therapies. Mind-body interventions include a range of practices and therapies aimed at facilitating the mind's capacity to affect health [10]. Mind-body therapies assume a bidirectional relationship between the mind and the body. Bodily sensations including pain and discomfort can affect mood and behaviour, and enteroceptive (feelings, thoughts) information has the ability to affect bodily processes [11].

There is increasing evidence for the efficacy of mind-body therapies in the treatment of several common clinical conditions (for example, coronary heart disease, arthritis[12, 13]). More recently there has been increasing alignment of mind-body therapies with conventional medical practice [14]. Given the evidence that patient pre-operative psychological factors play an important role in the recovery process after surgery, together with the wait list for patients requiring elective surgery, several mind-body interventions have been developed targeting patient pre-operative psychological factors.

Two meta-analyses have studied the effects of pre-surgical psychological interventions on post-operative outcomes. Devine [15] conducted a meta-analysis of 191 studies involving either psychoeducational or mind-body interventions, and found small to moderate beneficial treatment effects, with average effect sizes of 0.43 for improved recovery, 0.38 for pain reduction, and 0.36 for reduced psychological distress. Johnston and Vogele [16] examined pre-operative psychological interventions in 38 studies and found they were effective in improving psychological and medical outcomes after surgery, with an average effect size of 0.85 for pain reduction and 0.61 for improved recovery time. The psychological preparations analysed in these reviews covered a range of strategies including psychoeducational (procedural, sensory, exercises to perform, social support), behavioural instruction, cognitive intervention, relaxation, hypnosis and emotion-focused interviews. Although there is some overlap in these interventions, distinct differences exist in underlying treatment mechanisms, making it difficult to draw overall conclusions.

This systematic review will update and extend upon earlier reviews by Devine [15] and Johnston and Vogele [16] by distinguishing mind-body interventions from psychoeducational and psychological interventions. The aim of this paper was to conduct a systematic review of the available evidence of the efficacy of pre-operative mind-body based interventions on post-operative outcome measures amongst surgical patients. Such data can help to determine the utility of implementing pre-operative mind-body interventions on post-surgical outcomes for patients undergoing surgery.

Method

This systematic review was conducted according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement[17].

Search strategy

A literature search was undertaken using MEDLINE, CINAHL and PsycINFO. The search included papers published in English up to August 2012, with no restrictions placed on publication dates of the study. The main search terms of pre-operative, post-operative and mind-body therapy were combined. The full electronic search strategy is presented in Table 1. Additionally, citation tracking was performed by manually screening the reference lists of identified studies and review articles to identify any further relevant studies.

Study selection

Mind-body practices encompass a range of therapies including hypnosis, meditation, biofeedback, guided imagery, relaxation, mindfulness, music therapy, yoga, qigong and tai chi [18]. In this review mind-body therapies were limited to techniques requiring focused concentration, self-motivation and active participation from patients in their own health [19]. This included hypnosis, relaxation, guided imagery and mindfulness-based techniques. Owing to space constraints studies that examined more body-based therapies, such as yoga, qigong, and tai chi were excluded. Spiritual healing practices, such as prayer and distant healing, were also excluded as clearly manualised instructions are rarely reported. Furthermore, this review excluded cognitive-behavioural therapy (CBT), as this is largely considered a type of psychotherapy [19]. All titles and abstracts ascertained were independently assessed by an experienced researcher (EN) to exclude any irrelevant reports. A full manuscript of all the citations that were thought to be relevant were obtained. Pre-screening was performed independently by two reviewers (EN, SK) to determine whether they met the eligibility criteria (see below). Any disagreements regarding the selection of a manuscript were resolved by a final decision of a third reviewer (MD).

Studies were eligible for review if they met the following inclusion criteria: (1) included randomised controlled trials (RCTs) or quasi-randomised controlled clinical trials (CCT); (2) the article was written in English; (3) participants were aged 16 years or older; (4) participants underwent an elective surgery procedure requiring general anaesthesia, or a combination of several procedures requiring general and local or regional anaesthesia; (5) the study had a prospective before–after surgery design, where mind-body based care was provided to patients in the treatment group before the surgery, or where it straddled the procedure (i.e. both before and after); (6) outcome measures included psychosocial measures assessing participant's psychological well-being (e.g., anxiety, depression); (7) the assessment of these outcome measures followed the before-after surgery design; and (8) inclusion of an effective control group where patients underwent standard routine medical care or an attention placebo control group matching for the amount of time and attention received by the treatment group.

Studies were ineligible if: (1) the intervention comprised solely pharmacotherapy, counselling, or provision of specific information related to surgery (e.g., educational booklet) or health behaviour (e.g., exercise, dietary counselling); (2) the mind-body intervention was combined with pharmacotherapy; (3) interventions required spousal or family participation; (4) the surgical procedure was diagnostic in nature (e.g., biopsy) or an ambulatory/day procedure; (5) participants underwent surgical procedure requiring only local anaesthetic (e.g., removal of facial lesion, tooth extraction); and (6) and the study followed a post-operative only design where well-being measures were assessed only after surgery.

Description of mind-body interventions

Relaxation: relaxation interventions are aimed at inducing a state of reduced anxiety and muscle tension, together with a sense of calmness, and being at ease [20]. Relaxation can cover deep breathing practices, progressive muscle relaxation, Benson's relaxation response, or a combination of all.

Guided imagery: focuses and directs the imagination incorporating all the senses [21]. It is based on positive visualisation to help overcome physical symptoms and reduce anxiety and stress. In a surgical setting guided imagery involves patients imagining their healing process after surgery and affirming thoughts of confidence in the health care team [22, 23]. Guided imagery is designed to empower patients, promote relaxation, and guide patients to a place they feel safe and relaxed [23].

Hypnosis: creating a sense of awareness, arousal and concentration used to reduce stress and anxiety and increase relaxation [22]. By decreasing the perception of the external environment (dissociation) created by the intense involvement of a central object of concentration (absorption), patients become more likely to accept outside input (suggestibility) [12, 24]. This increased state of suggestibility can help lead to changes in subjective experience, alterations in perception, sensation, emotions, thoughts or behaviours [8].

Mindfulness: defined as "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment" [25] . Mindfulness training involves instruction in a number of meditation techniques as well as teaching on how to remain focused on the present moment in day to day activities [26].

Data extraction/collection process and synthesis

Data were extracted using a comprehensive, pre-designed data extraction spread sheet. Extracted information included: (1) participant characteristics (total number, age, gender); (2) type of surgery performed; (3) type of mind-body intervention; (4) control group details; (5)

main data collection-points; (6) pre-operative outcome measures; (7) post-operative outcome measures; and (8) statistically significant trial findings.

Assessment of risk of bias

Each eligible manuscript meeting the selection criteria was assessed for its methodological quality based on the criteria proposed by the Cochrane risk of bias tool [17, 27]: (1) generation of random allocation sequence; (2) concealment of allocation; (3) blinding of study personnel/outcome assessors; (4) reporting of incomplete outcome data; and (5) reporting of only selective outcome.

Results

Study selection

A summary of the study selection process is presented in Figure 1. The combined search using MEDLINE, CINAHL and PsychINFO with the English language limit resulted in a total of 1,570 potentially relevant articles. After duplicates were removed 1,317 articles remained. Through screening the title and abstracts, 102 articles were identified as possibly relevant for review and full-text articles were retrieved. After review of these full-text articles according to the eligibility criteria, a total of 20 articles were identified as eligible for review. Table 2 provides a summary of the 20 studies included in this systematic review.

Study characteristics

Participants

The 20 reviewed studies were all RCTs or CCTs, involving a total of 1,297 participants. The number of participants in each study ranged from 12 to 216, and 54.3% were female. Age ranged from 16 to 88 years, (mean age of 54.4). Of the 20 studies, 11 (55%) studies involved participants undergoing abdominal surgery, 4 (20%) cardiac surgery, 4 (20%) orthopaedic surgery, and 1 (5%) study involved participants undergoing lumbar and cervical spine surgery.

Description of intervention

Eight (40%) studies examined the influence of the mind-body intervention 'relaxation' on post-operative measures, eight (40%) studies examined relaxation combined with guided imagery, and four (20%) studies examined hypnosis combined with relaxation. The timing of pre-operative teaching of the mind-body interventions varied amongst the reviewed studies. The majority of studies taught participants mind-body techniques the day before surgery (70%), and three studies, at least three days before surgery (15%). Participants from two studies received training one week prior to surgery (10%), and in one study, 2-7 days pre-operatively (5%).

Most studies encouraged some form of practice of the mind-body technique after surgery. Eleven studies used the aid of audiotapes to help patients practice the techniques, with four studies instructing participants to practice as much as desired [28-31]; two studies instructed use of the audiotape from post-operative days 1-3 [32, 33] and from post-operative days 1-7 [34, 35], one study instructed participants to listen to the audiotape from post-operative days 1-2 [36] or from twice a day from post-operative days 1-6 [23]. Leserman et al. [37] also asked participants to practice twice per day post-operatively, but the number of post-operative days was not specified. The remaining nine studies did not use audiotapes. Two of these instructed participants to practice the technique as often as possible post-operatively [24, 38], in a further three studies, participants were seen post-operatively by a researcher to go over the techniques [39-41] and in one study participants were visited by a researcher on post-operative days one and two [42]. Three studies did not specify whether participants were provided instructions on post-operative practice of techniques [21, 43, 44].

Quality Assessment

The results of the risk of bias assessment are presented in Table 3. Each of the five components were rated as either '-' low risk for bias, '+' high risk for bias, or 'U' unreported. Two out of 20 studies were determined as low risk for potential bias, meeting all five quality assessment components [34, 35]. Two studies were determined as having a high risk of bias as randomisation methods (sequence allocation and allocation concealment) and blinding were not adequate [33, 41]). Two studies were rated as having a moderate risk of bias, with inadequate randomisation and insufficient detail of blinding of personnel/outcome assessors [28, 29]. Many studies did not adequately address or ignored reporting of sequence allocation (75%), allocation concealment (18 studies, 90%), and blinding of personnel/outcome assessors (50%). Overall, the majority of studies were judged as having a low risk of bias for incomplete outcome/attrition (70 %), and no clear evidence of selective reporting bias was identified.

Influence of relaxation interventions on improving post-operative outcomes

There was a high level of heterogeneity in the primary focus of relaxation interventions examined in this review. Overall the support for relaxation therapy as an effective pre-surgical intervention for improving post-operative outcomes was varied. Of the examined studies, all but one assessed analgesic intake as an indicator of treatment success. The majority of reviewed studies failed to find significant effects of relaxation on reducing post-operative analgesic intake [30, 36, 39, 41, 42]. The lack of evidence for the effectiveness of relaxation therapy is also supported by length of hospital stay, with two out of the three studies assessing this measure failing to find significant reductions [30, 36].

In terms of patient self-report of psychological well-being, there was only partial support for efficacy of relaxation therapy. Overall, three out of the eight relaxation intervention studies failed to show a reduction on these measures [36, 39, 41], whilst the remaining five studies found only partial support for beneficial effects. Significant differences between the relaxation group and control group existed for select variables including tension and anger [37], state anxiety [29], and pain [30, 31, 42]. Several studies found no support for relaxation intervention benefitting levels of pain [29, 36, 41]. Only one of five studies measuring anxiety provided partial support for the impact of relaxation therapy on anxiety levels [29]. This study found that relaxation patients were significantly less anxious than controls immediately after listening to the relaxation tape and on the first post-operative day, but this difference disappeared by the second post-operative day.

Influence of guided imagery on improving post-operative outcomes

Overall, the current systematic review provided considerable evidence for the efficacy of guided imagery on post-operative outcomes. In terms of psychological well-being, only one out of eight studies failed to find any beneficial effects of guided imagery [21]. All studies that assessed pain, found guided imagery to be effective in reducing post-operative levels [23, 28, 33, 40]. However, effects on post-operative anxiety were less consistent, with half of the studies measuring anxiety finding significant benefits [23, 32, 33]. There was moderate support for the efficacy of guided imagery in reducing analgesic intake, with two out of three studies assessing post-operative levels finding significant reductions amongst the guided imagery group [23, 28]. Only one study assessed the impact of guided imagery on length of hospital stay, with non-significant effect [23].

Influence of hypnosis on improving post-operative outcomes

We found only partial support for the efficacy of hypnosis on post-operative anxiety levels, pain perception [44] and tension [24, 38]. One of the four reviewed studies examining hypnosis did not find any significant effect on psychological variables [43]. Only one of the four hypnosis intervention studies reviewed assessed the effect on analgesic intake. Ashton et al. [38] found a non-significant difference in pain medication use between patients practicing hypnosis and control patients. The authors noted that this was related to adherence to instructions for the practice of hypnosis, with adherent patients using less pain medication. The effect of hypnosis on length of hospital stay was assessed by Ashton et al. [38] and Field [43], with both studies reporting non-significant effects.

Influence of mind-body therapies on physiological indices

In this review just over half of the studies assessed a physiological measure, mostly measuring patient vital signs (e.g., heart rate, blood pressure, respiration). There was minimal support for the efficacy of mind-body therapies in improving vital signs, with only two studies reporting significant reductions in blood pressure [29, 33]. Four studies assessing endocrine measures (i.e., cortisol, adrenaline, noradrenaline) demonstrated significant changes [28, 29, 31, 32], albeit, there were somewhat inconsistent results regarding the direction of change on these measures.

Discussion

Despite continued advances in technology, there still remains a significant proportion of patients with moderate to severe negative post-operative outcome measures [45]. For example, up to 40% of patients who undergo elective joint replacement surgery report suboptimal pain relief, functional improvements and satisfaction after surgery [46]. The effective management of post-operative pain is a major concern for patient well-being and healthcare resource utilization. Pre-operative patient psychological factors have been identified as strong predictors of post-operative outcomes, with the increasing integration of mind-body therapies with conventional medical practice [14, 22].

Mind-body therapies typically focus on the relationships between the brain, mind, body, and behaviour, and their effect on health and disease [8]. Mind-body therapies encourage patients to take responsibility for their own health and to become actively involved in their care and wellbeing. Mind-body therapies are also relatively low cost since they can be administered by nurses and other health care providers, and are largely free from adverse side effects [14]. This supports the need for a current evaluation of the effectiveness of pre-operative mind-body interventions on post-operative outcomes. The scope of this review was limited to relaxation, guided imagery, hypnotic, and mindfulness based mind-body techniques.

This systematic review identified 20 studies examining mind-body therapies amongst surgical patients. The large variation in methodology and study quality of the reviewed studies made it difficult to compare the results from different studies and limited the ability to make overall conclusions regarding the efficacy of pre-surgical mind-body interventions on post-operative outcomes. The efficacy of relaxation was assessed in 8 studies, with overall results finding partial support for improvements in psychological well-being measures. Eight studies examined the efficacy of guided imagery, with strong evidence for improvements in psychological well-being measures. Hypnosis was investigated in four studies, with partial support for improvements in psychological well-being measures.

Analgesic intake is used as an index of surgical pain, and certain pain medications can lead to several side effects (e.g., nausea, drowsiness; [47]). Therefore, reductions in analgesic intake can be interpreted as a reduction in post-operative pain. In the current review there was lack of evidence for beneficial effects for analgesic intake. Therefore from this measure it could be concluded that overall the mind-body therapies did not have an effect on decreasing patient's post-operative pain. However, several authors have cautioned over the use of analgesic intake as a measure of pain, as levels are also a function of patients' reluctance to request medication and nurses assessment of patient need [30]. There was also lack of evidence for the efficacy of mind-body therapies in reducing length of hospital stay. Length of hospital stay was largely a secondary measure, which raises concerns over whether the studies were adequately powered to detect small differences of in the mean length of stay between two groups [48]. Furthermore, as with analgesic intake, length of hospital stay is also influenced by medical system factors, such as insurance.

One of the proposed mechanisms by which complementary therapies work is through the influence of mind-body interactions on the immune system [49]. Negative emotions can also have a direct influence on increased pain perception [9]. Evidence for the efficacy of mind-body therapies improving physiological indices remains limited, with minimal effects on vital signs, and inconsistent changes in endocrine measures. These contradictory results point to the importance of measuring these together with self-report questionnaire well-being measures when assessing mind-body therapies.

Limitations

This systematic review has several limitations. Firstly, this review may be susceptible to language bias as the search strategy was limited to studies published in English. The majority of trials were evaluated as having a low quality of evidence. This was largely the result of studies not adequately addressing or providing insufficient detail to enable the accurate judgement of randomisation methods (sequence allocation and allocation concealment) and blinding of personnel/outcome assessors. The quality of evidence was rated 'high' in only two of the reviewed studies. Therefore, caution needs to be taken over the generalizability of the reported findings.

Many of the reviewed studies had a small sample size, indeed, only three had 50 or more participants in each allocation group. Therefore, most studies may not have been adequately powered to detect improvements in post-surgical outcome measures amongst mind-body therapy participants. Although several of these studies noted small sample size as a limitation, a power calculation was performed in only two studies [34, 35]. Conversely, a small sample size may be associated with greater risk of inflated effect size as a result of higher participant adherence rates than would be expected in clinical settings due to concentrated researcher attention [50].

Recommendations for future research

The mind-body therapies reviewed largely involve altering the context of the negative experience and pain. Research suggests that strategies which instead promote an acceptance and openness of experiences, without focusing on ignoring or avoiding pain, could be more effective, including mindfulness [51]. Evidence suggests that mindfulness training used to manage chronic disease (e.g., multiple sclerosis, fibromyalgia) helps alleviate associated psychological distress and enhance patients' wellbeing [26, 52]. However, we did not identify any published studies exploring the effectiveness of mindfulness training in improving post-operative outcomes. Clearly this is an important area for future research.

An important research question involves the influence of the frequency and timing of mind-body therapies on efficacy. In the current review the majority of studies taught mind-body techniques on the day before surgery. It could be argued that participants did not have sufficient time to learn and practice the techniques [38]. Furthermore, training on the pre-operative day may be problematic as this is usually when anxiety levels are heightened, interfering with the ability to learn [53]. The efficacy of mind-body therapies are also likely to be influenced by how often patients practice the intervention throughout the recovery period. In this review most of the studies encouraged some form of practice of the technique after surgery. However, the majority of studies did not provide specific instructions. Future research should explore this dose-response effect to determine optimal conditions for timing and reinforcement of the intervention [20].

The timing of assessment of outcome measures is also an important factor to consider. Measuring outcomes in the immediate post-operative period may lead to reduced treatment efficacy as patients may still be suffering from effects of anaesthetic, making it difficult to apply the techniques learnt pre-operatively. In the current review post-operative outcomes measures were largely assessed between 1-7 days post-operatively. This review also demonstrates the importance of measuring post-operative outcomes on more than one occasion, with several studies finding significant effects for select post-operative days only [29, 30, 32, 33, 35, 44]. Future research may find greater support for pre-surgical mind-body interventions if the assessment period for outcome measures is extended beyond the first few post-operative days. Extending this period will allow future research to evaluate possible long-term effects.

Conclusion

This review demonstrates the limited quality evidence for the efficacy of mind-body therapies for improving post-surgical outcomes. In order to make recommendations regarding the appropriateness of mind-body interventions for pre-surgical patients, future studies need to address the limitations identified in this review. Specifically, to improve the quality of conducting and reporting RCTs future research should follow formal guidelines, for example CONSORT guidelines, [54]. Trials need to be adequately powered to detect clinically significant treatment effects, and future research should include an adequate follow-up period to determine the long-term efficacy of interventions. Future research should attempt to explore the underlying mechanisms involved in the efficacy of mind-body therapies by further exploring potential moderating variables (e.g., personality factors and individual characteristics). Furthermore, continuing to incorporate measures of physiological indices of stress may provide greater evidence for the efficacy of mind-body therapies, and may provide further insight into the mechanisms underlying treatment effects. This will lead to more targeted and effective integration of mind-body therapies with medical practices.

Ethical approval

Not applicable.

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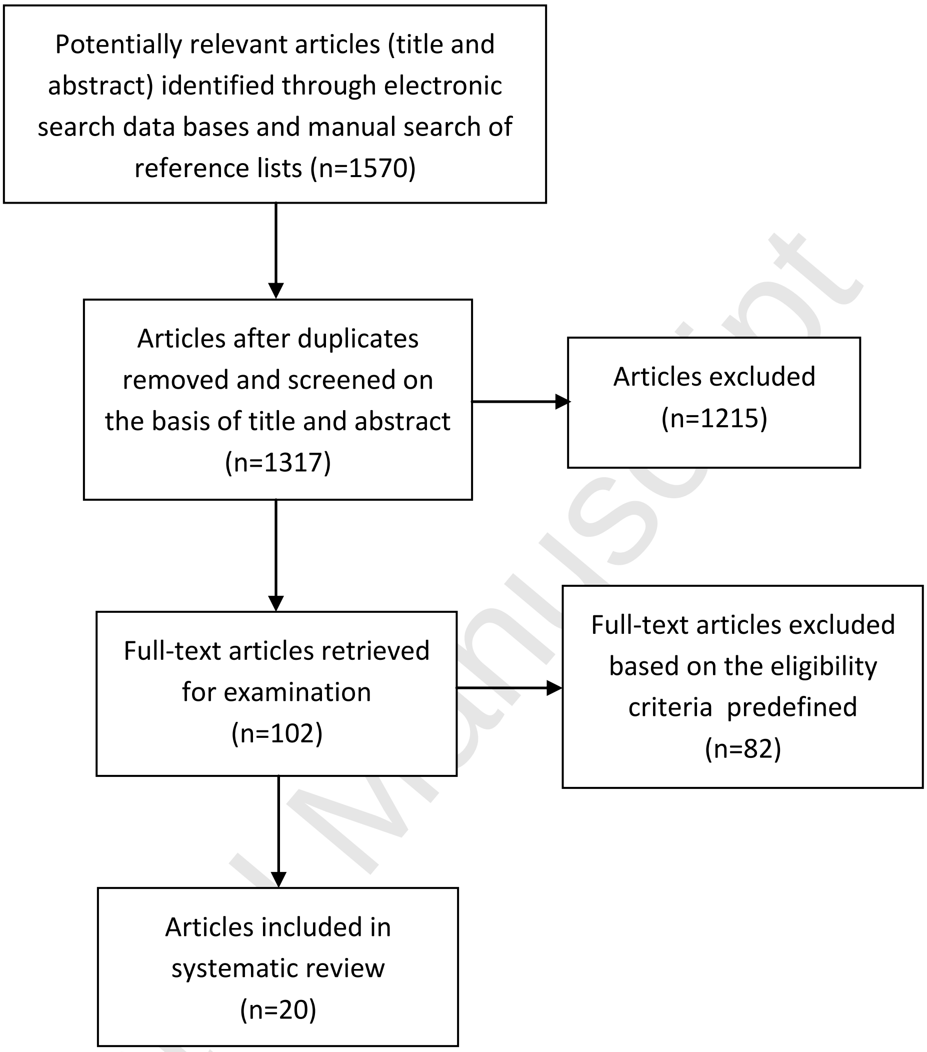
Potentially relevant articles (title and abstract) identified through electronic search data bases and manual search of reference lists (n=1570)
Articles after duplicates removed and screened on the basis of title and abstract (n=1317)
Articles excluded (n=1215)
Full-text articles retrieved for examination (n=102)
Full-text articles excluded based on the eligibility criteria predefined (n=82)
Articles included in systematic review (n=20)

Figure 1

Flow Diagram of Study Selection Process.

Table 1 Search strategy.

MEDLINE
[(MH "Mind-Body Therapies") OR (MH "Breathing Exercises") OR (MH "Hypnosis") OR (MH "Imagery (Psychotherapy)") OR (MH "Meditation") OR (MH "Mental Healing") OR (MH "Relaxation Therapy") OR (MH "Therapeutic Touch") OR "mindfulness" OR "mind-body" OR "breathing exercise*" OR "hypnosis" OR "guided imagery" OR "visual imagery" OR "mental imagery" OR "meditat*" OR "mental healing" OR "relaxation" OR "therapeutic touch*"] **AND** [(TI postoperative AND TI outcome*) OR (MH "Pain, Postoperative/PC") OR (MH "Perioperative Period") OR (MH "Preoperative Period") OR (MH "Perioperative Care") OR (MH "Preoperative Care") OR (MH "Perioperative Nursing") OR "preoperat*" OR "pre-operat*" OR "presurg*" OR "pre-surg*" OR "before surgery" OR "perioperat*" OR "peri-operat*"]
CINAHL
[(MH "Hypnosis") OR (MH "Meditation") OR (MH "Mind Body Techniques") OR (MH "Mental Healing") OR (MH "Guided Imagery") OR (MH "Distraction") OR (MH "Relaxation Techniques") OR "mindfulness" OR "mind-body" OR "breathing exercise*" OR "hypnosis" OR "guided imagery" OR "visual imagery" OR "mental imagery" OR "meditat*" OR "mental healing" OR "relaxation" OR "therapeutic touch*"] **AND** [(TI postoperative AND TI outcome*) OR (MH "Postoperative Pain/PC") OR (MH "Perioperative Care") OR (MH "Preoperative Care") OR (MH "Perioperative Nursing") OR (MH "Pretransplantation Period") OR (MH "Preoperative Period") OR "preoperat*" OR "pre-operat*" OR "presurg*" OR "pre-surg*" OR "before surgery" OR "perioperat*" OR "peri-operat*"]
PsychINFO
[DE "Mindfulness" OR DE "Relaxation Therapy" OR DE "Progressive Relaxation Therapy" OR DE "Guided Imagery" OR DE "Hypnotherapy" OR DE "Meditation" OR DE "Muscle

Relaxation" OR DE "Hypnosis" OR "mindfulness" OR "mind-body" OR "breathing exercise*" OR "hypnosis" OR "guided imagery" OR "visual imagery" OR "mental imagery" OR "meditat*" OR "mental healing" OR "relaxation" OR "therapeutic touch*"] **AND** [(TI postoperative AND TI outcome*) OR "preoperat*" OR "pre-operat*" OR "presurg*" OR "pre-surg*" OR "before surgery" OR "perioperat*" OR "peri-operat*"]

Table 2 Summary of pre-surgical mind-body based interventions included.

Author (year)	Participants	Type of surgery	Control group	Timing of intervention	Data collection points	Main outcome measures	Main findings
<u>Relaxation:</u>							
Daltroy *et al.* (1998)	*N*=216; Age (yrs)=64, range 20-88; female (%)=66; Relaxation TG: *N*=58; CG: *N*=54	Orthopaedic	Usual care	18-min audiotape with oral & written instructions day before surgery. Reminder from researcher to use technique 1 to 2 PODs	Pre-op, POD 4	Pre-op: anxiety, denial, pain, desire for info, sense of control over pain Post-op: anxiety, mental status, length of hospital stay, analgesic intake	No significant influence of relaxation intervention on post-op outcomes, however likely due to time constraints.
Gavin *et al.* (2006)	*N*=49; TG: *N*=27, female (%)=74%, Age (yrs)=56 ± 16; CG: *N*=22, female (%)=68%, Age (yrs)=56 ± 18	Lumbar and spine	Usual care	20-30 min session with researcher a week before surgery. Encouraged to practice before surgery. Seen immediately post-op by researcher to go over technique	Pre-op, POD 1, POD 2	Pre-op: anxiety, physical & mental health, distress, positive & negative affect Post-op: pain, analgesic intake, vital signs (oxygen saturation, respiratory rate, sedation score)	Analgesic use was significantly higher in the relaxation group on POD 1 and POD 2 compared to the control group.
Leserman	*N*=27; TG: *N*=13,	Cardiac	Usual	Training received 2-7	Baseline (2-7	Pre- & post-op: systolic &	Intervention group had

et al. (1989)	Age (yrs)=65.3 ± 7.1, male (%)=69; CG: *N*=14, Age (yrs)=69.6 ± 9.7, male (%)=64		care	days pre-op. Asked to practice twice/day before & after surgery with aid of tape (length unspecified)	days pre-op), each day after surgery until discharge, excluding POD 1	diastolic BP, heart rate, SVT, sleep, tension, depression, anger, fatigue, vigor, confusion	significantly lower post-op SVT than CG. Relaxation group also had significantly greater decrease in tension & anger; however this may have reflected regression to the mean.
Manyande *et al.* (1992)	*N*=40, male (%)= 55; TG: *N*=21, Age (yrs)=42 ± 12.6; CG: *N*= 19, Age (yrs)=47 ± 14	Abdominal	Attention control	15-min audiotape day before surgery, morning of surgery, as much as desired post-op	Questionnaire measures: pre-op, 1 & 2 POD's; Endocrine measures: recruitment, immediately pre-& post-op	Pre & post-op: endocrine: cortisol, adrenaline, noradrenaline; Vital signs: systolic & diastolic BP, heart rate; analgesic intake; Questionnaire: state/trait anxiety, personality recovery, pain intensity & distress, coping	Significant increase in cortisol & adrenaline from immediately pre-op to immediately after in TG. Noradrenaline was unaffected. Significant reduction in state-anxiety & BP on POD 1 and 2 in TG. Analgesic intake was significantly less in the TG on POD's 1 & 2 compared to controls.

Manyande & Salmon (1998)	*N*=118, female (%)=51, Age (yrs)=42, range 16-79; TG: *N*=59, Age (yrs)=42 ± 15; CG: *N*=59, Age (yrs)=38 ± 20	Abdominal	Attention control	15-min audio twice/day on pre-op day. Asked to listen to tape once while waiting for surgery, and as much as desired post-op	Pre-op, immediately after listening to tape, each of the 7 POD's	Pre-op: state/trait anxiety, recovery, coping, pain (intensity & distress) Post-op: state/trait anxiety, recovery, coping, pain (intensity & distress), length of hospital stay, analgesic intake	TG had lower intensity of pain throughout the post-op period, & distress was reduced early in the post-op period only. There were mixed findings relating to analgesic intake.
Scott *et al.* (1984)	*N*=64, Age(yrs)=43, range 19-70, female= (%) 86	Abdominal	Attention control	10-min session with examiner day before surgery. Instructed to practice at least 4 times/day post-op	Pre-op, POD 2 and 4	Pre- & post-op: coping, state/trait anxiety, pain Post-op: analgesic intake	No significant effects of treatments on any outcome measures. However, for patients with a sensitizing coping style, TG resulted in reduced post-surgical pain. For patients with an avoiding coping style there was no significant benefit of the treatment.

Wells (1982)	*N*=12, Age (yrs)=53.5, range 30-70; TG: *N*=6, male (%)=67; CG: *N*=6, female (%)=67	Abdominal	Attention control	45-70 min session with assistant day before surgery. 10-25min session POD's 1 and 2	Pre-op, POD 1, 2 & 3	Pre-op: abdominal muscle tension, pain (intensity and distress) Post-op: abdominal muscle tension, pain, analgesic intake, time in surgery & recovery room, complications, discomfort	Experimental group reported significantly less distress caused by painful sensations post-op, however no significant differences in physiologic measures.
Wilson (1981)	*N*=70, Age (yrs)=42.3 ± 10.47, female (%)=90	Abdominal	Usual care	25-min audiotape once the evening before surgery. As often as desired post-op	Pre-op, POD 1, 2 & 3	Pre-op: personality variables (denial, fear, aggressiveness) mood, social support, coping, Post-op: Length of hospital stay, analgesic intake, recovery, pain, ambulation, epinephrine & norepinephrine	Relaxation group had reduced hospital stay, pain, analgesic intake, & increased strength, energy & epinephrine levels. Pre-op personality variable fear significantly influenced the effectiveness of relaxation in reducing length of hospital stay.

Guided imagery:

Broadbent *et al.* (2012)	TG: *N*=30, Age (yrs)=52.1 ± 18 female (%)=80; CG *N*=29, Age (yrs)=50.5 ± 15.5, female (%)=70%	Abdominal	Usual care	45-min session with psychologist at least 3 days pre-op. 20-min audio each day prior to surgery (reminder from psychologist). Practiced PODs 1-7	Baseline (at least 3 days prior to surgery, range 3-132 days), POD 7	Pre- & post-op: perceived stress Post-op: hydroxyproline deposition in wound, fatigue	Significant reduction in perceived stress from pre-op to POD 7 in the TG compared to CG. TG had significantly higher hydroxyproline wound deposition (indication of wound healing) compared to CG.
Holden-Lund (1988)	TG: *N*=12, female= (%)=96, Age (yrs)=49 ± 12.1; CG: *N*=12, female= (%) 96%, Age (yrs)=46 ± 15.4	Abdominal	Attention control	20-min audio day prior to surgery. 20-min audio POD 1-3	Baseline (2 days prior to surgery), POD's 1, 2 and 3	Pre- & post-op: state anxiety, urinary cortisol Post-op: surgical wound healing inventory (edema, erythema, exudate)	TG had significantly less state anxiety post-op compared to the CG, and significantly lower cortisol levels on POD 1 only. The TG had significantly less erythema at wounds that did controls.
Kahokehr *et al.* (2012)	TG: *N*=30, Age (yrs)=51, range 19-84, female (%)= 81;	Abdominal	Usual care	45-min session with psychologist at least 3 days prior to surgery.	Pre-op, POD's 7, 14 and 30	Pre-op: body mass index Pre-op & post-op: fatigue, vigour, mental function,	There was improved post-op fatigue experienced and consequence of fatigue on day

	CG: *N*=30, Age (yrs)=51, range 21-82, female (%)=70%			Instructed to listen to 20-min audio each day prior to surgery and each of the 7 PODs		impact on patient energy, impact on activities of daily living	30 only in the intervention group.
Lin (2012)	*N*=93, Age (yrs)=71.0 ± 11.1, female (%)=65; TG: *N*=45; CG: *N*=48	Orthopaedic	Usual care	Researcher taught relaxation to patients on pre-op day. From POD's 1-3 researcher assisted patients listening to 20-min audio. Patients encouraged to practice when desired	Measures were assessed before and after the intervention from pre-op to POD 3	Pre-op & post-op: pain, anxiety & state/trait anxiety, BP (systolic & diastolic), heart rate	Pain was reduced significantly after relaxation therapy in the TG. The mean differences in pain in the TG were higher than those in the CG on pre-op & POD 1. Differences in severity of anxiety in the TG on pre-op, POD1 & 2 were greater than the CG. Systolic BP in the TG were significantly lower than those in the CG.
Manyande *et al.* (1995)	*N*=51; TG: N=26, Age (yrs)=47 ± 13.8, male (%)=58;	Abdominal	Attention control	15-min audiotape day before surgery, morning of surgery, as much as	Questionnaire: Pre-op, POD's 1 & 2;	Pre-op & post-op: endocrine: cortisol, adrenaline, noradrenaline;	TG experienced less post-op pain, were less distressed by it, felt they coped better with it,

	CG: *N*=25, Age (yrs)=44 ± 15.4, male (%)=60			desired post-op	Endocrine: recruitment, immediately pre-and post-op	Vital signs: systolic & diastolic BP, heart rate; Questionnaire: state/trait anxiety, type A personality, recovery, pain intensity & distress, coping, health opinion, desire for control Post-op: analgesic intake	& requested less analgesia than CG; Cortisol levels were significantly lower in TG group than in CG pre- & post-op. Noradrenaline levels were significantly greater in TG & did not decline as in the CG. There was no significant difference in post-op adrenaline levels.
Mogan *et al.* (1985)	*N*=72, Age (yrs)=41.5; TG: *N*=40, female (%)=85; CG: *N*=32, female (%)=78	Abdominal	Attention control	Researcher taught technique pre-op, length unspecified. Reminder to use technique from experimenter the morning after surgery	Pre-op, POD 1, 2, 3, & 4	Pre-op & post-op: pain (sensation & distress); vital signs: BP, pulse and respiration. Post-op: analgesic intake	There were no significant differences between the TG & CG for vital signs, analgesic intake, & pain sensation. Distress caused by painful sensations was significantly lower in the TG.
Stein *et al.* (2010)	Guided imagery: *N*=20,	Cardiac	Usual care	Instructed to listen to audiotape at least 1/day	Baseline (2-4 weeks),	Pre-op & post-op: anxiety, depression, mood	No significant difference between TG and CG in post-op

	Age(yrs)=68.7 ± 8.7 , male (%)=55; CG: *N*=19, Age (yrs)=65.4 ± 11.0, male (%)=95			everyday for 1 week before surgery. Listened to tapes intra-operatively. No post-op practice specified	1 week & 6 months post-op	(disturbance, tension-anxiety, tension-depression, anger-hostility, fatigue-inertia, confusion-bewilderment, vigour-activity)	scores at either 1 week or 6 months for any outcome measures.
Tusek *et al.* (1997)	*N*= 130, Age (yrs)=40, range 17-78; TG: *N*=65, Age (yrs)=40; CG: *N*=65, Age (yrs)=39	Abdominal	Usual care	20-min audio twice/day for 3 consecutive days pre-op. Listened to audio twice/day for PODs 1-6	Baseline (pre-intervention), immediately pre-op; during the morning & evening of POD's 1-6	Baseline, pre-op, post-op: Anxiety, pain (worst and least levels experienced) Post-op: analgesic intake, length of hospital stay, time to first bowel movement	Pre-surgery, anxiety increased significantly in CG but decreased in TG. Analgesic consumption & time to first bowel movement was significantly lower in TG compared with CG. Guided imagery significantly reduced post-op anxiety & pain.
<u>Hypnosis:</u>							
Ashton *et al.* (1995)	*N*= 22, male (%)=86; TG: *N*=13, Age (yrs)=64, range	Cardiac	Usual care	Training night before surgery, length unspecified. Asked to	Pre-op & POD 5	Pre-op & post-op: tension, depression, anger, vigour, fatigue, & concentration	Compared with CG, the TG were significantly more relaxed post-op than pre-op.

	47-81; CG:*N*= 9, Age (yrs)=67, range 57-71			practice hourly the night prior to surgery and as often as possible post-op			There were also non-significant trends toward improvements in depression, anger & fatigue.
Ashton *et al.* (1997)	TG: *N*=20, Age (yrs)=64 ± 3, male (%)=85; CG: *N*=12, Age (yrs)=62 ± 3, male (%)=92	Cardiac	Usual care	Training night before surgery, length unspecified. Asked to practice hourly the night prior to surgery and as often as possible post-op	Pre-op & POD 5	Pre-op & post-op: tension, depression, anger, vigour, fatigue, confusion Post-op: pain management, analgesic intake, length of hospital stay, operative parameters	The TG were significantly more relaxed post-op compared to the CG.
Field (1974)	*N*= 60, male (%)=97; TG: *N*=30; CG: *N*=30	Orthopaedic	Attention control	20-min audiotape day before surgery. No post-op practice specified	Pre-op & between 2-7 days post-op	Pre-op: emotional reactions to surgery, nervousness Post-op: emotional reactions to surgery, speed of recovery & length of hospital stay	No significant differences between the TG & CG on length of hospital stay, degree of nervousness or speed of recovery. However, in the TG there was a significant correlation with depth of relaxation & absence of

							nervousness day of operation & speed of recovery.
Massarini *et al.* (2005)	*N*=42, male (%)=52, Age (yrs)=51.12, range 16-79; TG: *N*=21; CG: *N*=21	Orthopaedic	Usual care	15-30 min session during 24-hours pre-op. No post-op practice specified	Baseline questionnaire & physiological measures collected weeks pre-op, every day for first 4 POD's	Pre-op & post-op: state/trait anxiety, depressive values, physiological indices (heart rate, BP, body temperature) Post-op: pain perception (sensory & affective)	TG showed significantly lower levels of anxiety (state & trait) compared to baseline levels & significantly lower pain perception (sensory & affective) in the first 2 POD's compared to the CG.

TG, Treatment group; CG, Control group; Baseline, pre-operatively before surgery; POD, Post-operative day; Pre-op, day before surgery; SVT, supraventricular tachycardia; BP, blood pressure.

Table 3 Assessment of risk of bias

	Sequence allocation	Allocation Concealment	Blinding of personnel/outcome assessors	Incomplete outcome, attrition	Selective reporting
Ashton *et al.* (1995)	-	U	-	U	-
Ashton *et al.* (1997)	U	U	-	-	-
Broadbent *et al.* (2012)	-	-	-	-	-
Daltroy *et al.* (1998)	U	U	-	-	-
Field (1974)	U	U	-	U	-
Gavin *et al.* (2006)	U	U	-	-	-
Holden-Lund (1988)	U	U	U	-	-
Kahokehr *et al.* (2012)	-	-	-	-	-
Leserman *et al.* (1989)	U	U	+	-	-
Lin *et al.* (2012)	+	+	+	U	-

Manyande *et al.* (1992)	+	+	U	-	-
Manyande *et al.* (1995)	+	+	U	-	-
Manyande *et al.* (1998)	U	+	-	-	-
Massarini *et al.* (2005)	U	U	-	U	-
Morgan *et al.* (1985)	-	U	+	U	-
Scott *et al.* (1984)	+	+	+	-	-
Stein *et al.* (2010)	+	U	U	-	-
Tusek *et al.* (1997)	-	U	U	-	-
Wells (1982)	U	U	U	U	-
Wilson *et al.* (1981)	U	U	-	-	-

'-' represents low risk for bias, and '+' represents high risk for bias; 'U' indicates the information was unreported.