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Review Article

The Effects of Massage Therapy on Pain and Anxiety after Surgery: A Systematic Review and Meta-Analysis

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Abstract:

Pain management is critical for patients after surgery, but current pain management methods are not always adequate. Massage therapy may be a therapeutic complementary therapy for pain. Many researchers have investigated the effects of massage therapy on post-operative pain, but there have been no systematic reviews and meta-analysis of its efficacy for post-operative patients. Our objective was to assess the effects of massage therapy on pain management among post-operative patients by conducting a systematic review and meta-analysis. The databases searched included MEDLINE, CINAHL, and the Cochrane Library's CENTRAL. To assess the effects of massage therapy on post-operative pain and anxiety, we performed a meta-analysis and calculated standardized mean difference with 95% CIs (Confidential Intervals) as a summary effect. Ten randomized controlled trials were selected (total sample size = 1,157). Meta-analysis was conducted using subgroup analysis. The effect of single dosage massage therapy on post-operative pain showed significant improvement (−0.49; 95% confidence intervals −0.64, −0.34; $p < .00001$) and low heterogeneity ($p = .39$, $I^2 = 4\%$), sternal incisions showed significant improvement in pain (−0.68; −0.91, −0.46; $p < .00001$) and low heterogeneity ($p = .76$, $I^2 = 0\%$). The anxiety subgroups showed substantial heterogeneity. The findings of this study revealed that massage therapy may alleviate post-operative pain, although there are limits on generalization of these findings due to low methodological quality in the reviewed studies.

Many patients undergo surgical procedures as part of treatment. Weiser et al. (2015) estimate that there was a 33.6% increase in the number of surgical operations worldwide from 2005 to 2013. Many patients experience postoperative pain, which includes incisional pain from inflammation of tissues, irritation from the presence of drainage tubes, discomfort from being in the same position,

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and anxiety as a result of lack of knowledge of the postoperative process. Postoperative pain management is critical for satisfactory recovery from surgery. To assess patients' perceptions of postoperative pain management, Gan, Habib, Miller, White, and Apfelbaum (2014) conducted a survey that included a total of 300 participants who had undergone surgery and reported that 39% still complained of moderate or severe pain after their first dose of medication. Furthermore, Kolettas et al. (2015) noted that nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids are often used, which may produce negative side effects such as nausea, vomiting, somnolence, or respiratory depression. Therefore, postoperative pain might be managed by multimodal treatment plan that includes nondrug strategies like massage therapy (Meissner et al., 2015).

Inadequate pain management could delay the recovery of postoperative patients. According to Kehlet and Dahl (2003), adequate pain management can decrease anxiety and reduce autonomic activity. When pain is not managed properly, the restoration of organ functions could be delayed and desired postoperative outcomes would not be met. Therefore, some guidelines emphasize the use of multimodal pain management (American Association of Nurse Anesthetists, 2016; American College of Chest Physicians, 2013; American Pain Society, 2016; Australian and New Zealand College of Anesthetists, 2015). In a published guideline on postoperative pain, one expert panel recommended using multimodal regimens as the current evidence of postoperative pain management even though the guidelines stressed the need for additional research (American Pain Society, 2016). In addition, the American College of Chest Physicians (2013) also recommended that health care professionals use multimodal care for patients who suffer from pain or anxiety.

Complementary and alternative medicine (CAM) is becoming more widespread and recommended; CAM therapy can work adjunctively with conventional Western medicine and has fewer side effects (Lindquist, Snyder, & Tracy, 2014). Massage therapy is one of the most popular CAM practices, and many studies have validated its beneficial effects in pain management of various conditions, including arthritis and fibromyalgia (Field, 1998, 2016). A greater awareness by nurses of the various options for pain management will benefit patients. Gate control theory is a theoretical framework often used to explain the process of pain reduction through massage (Melzack & Wall, 1965). Based on this theory, the pressure of massage closes the "gate" that modulates the transmission of pain stimuli to the brain (Field, 1998; Moyer, Rounds, & Hannum, 2004). Massage therapy may also increase serotonin levels (Ironson et al., 1996) where a neurotransmitter plays a role in reducing pain by inhibiting the transmission of noxious nerve signals to the brain (Field, 1998). Anxiety also can be managed with massage therapy (Billhult & Maatta, 2009; Field, 2014; Pan, Yang, Wang, Zhang, & Liang, 2014). Relaxation may be promoted by massage therapy, and it in turn enhances the function of the parasympathetic nervous system and fosters immunologic effects (Papathanassoglou & Mpouzika, 2012), which are beneficial for postoperative patients. Although there is an acceptance of CAM in the general population, health care professionals have faced challenges in adopting it. Trail-Mahan, Mao, and Bawel-Brinkley (2013) conducted a survey of 153 acute care registered nurses in California and found that nurses had not integrated CAM into their practice because they lacked belief in and knowledge about CAM.

Systematic reviews and meta-analyses of randomized controlled trials (RCTs) represent the highest level of evidence because of systematic processes such as comprehensive literature searches and selection, critical appraisal of primary studies, and synthesis of research results (Akobeng, 2005). Therefore, they are essential tools for summarizing and providing accurate and reliable evidence and help clinicians to judge risks and benefits of health care interventions related to patient care (Hutton et al., 2015). Many systematic reviews contain meta-analysis, which summarizes the quantitative results of related studies by using statistical methods (Borenstein, Hedges, Higgins, & Rothstein, 2009; Higgins & Green, 2008).

Systematic reviews and meta-analysis investigating massage intervention have increased. Moyer et al. (2004) conducted a meta-analysis that yielded 37 studies and a total of 1,802 participants to investigate the overall effect of massage therapy and concluded that this intervention reduced state anxiety, blood pressure, and heart rate. In their meta-analysis, Labyak and Metzger (1997) suggested that longer sessions of massage therapy may stimulate the parasympathetic nervous system and vasodilation. Several systematic reviews reported that massage therapy may be effective by providing supportive care in some symptoms related to cancer treatment (Ernst, 2009; Lee, Lee, & Ernst, 2011; Pan et al., 2014; Lee, Kim, Yeo, Kim, & Lim, 2015; Shin et al., 2016). Many systematic reviews have investigated the effects of massage therapy, but there have been no studies of its efficacy on postoperative patients. Therefore, the objective of this research was to assess the effects of massage therapy on pain and anxiety among postoperative patients by conducting a systematic review and meta-analysis.

METHODS

Eligibility Criteria

Participant data were from hospitalized patients who underwent surgery with general anesthesia. Studies of pregnant women who had undergone Caesarean section and patients younger than 15 years of age were excluded. The intervention was massage therapy, defined as manipulation of soft tissues and required physical contact. Studies of healing touch and therapeutic touch, which do not require physical contact, were excluded. Reflexology was excluded because its aim is to stimulate trigger points. A study with more than one intervention group was included if it had a massage intervention group and a control group. Control groups consisted of individuals who received routine care. The primary outcomes were pain and anxiety. Only RCT studies were included to ensure an adequate discrimination of the effects of massage therapy from spontaneous recovery. Studies were excluded if they were not written in English. No limit was placed on year of publication.

Search

The databases MEDLINE, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Cochrane Library's CENTRAL were searched by a research librarian and the primary researcher in March 2015. A manual search was conducted by reviewing references from all relevant articles to identify missing studies through a database search. If a study was only presented at conference, the author was contacted to identify and obtain the results of the study.

Study Selection and Data Collection Process

After two independent researchers independently screened the title and abstract, the full text of each study was reviewed to determine whether it met the study criteria. Any disagreement during this process was resolved by discussion. If the data were not reported in the published paper, the primary authors were contacted. After the studies were selected, the two researchers extracted the data using a coding sheet, which included the study description, the research methods and results, and an assessment of research quality.

Risk of Bias within Individual Studies

Conclusions about the effects of massage intervention relied on the data and results from the selected studies. Therefore, the evaluation of the validity of the selected studies was a critical component in the systematic review and meta-analysis, and it determined whether the study asked an appropriate question and whether the study answered its research questions correctly (Higgins & Green, 2008). In this review, only RCT studies were included, and the two researchers assessed methodologic quality using the Cochrane Collaboration's tool for assessing risk of bias (Higgins & Green, 2008). The risk of bias for each item was rated as "yes" (indicating a low risk of bias), "no" (a high risk of bias), or "unclear" (an uncertain or unknown risk of bias). There was a total of six points. A cutoff point of three high or low risk ratings was used to classify the quality of the research method for each study. For example, a study displaying high-quality research methods would have received more than three "yes" ratings. Three "no" ratings indicated low quality.

Summary Measures

To assess the effect of massage therapy on postoperative pain and anxiety, we performed a meta-analysis using Cochrane Collaboration software Review Manager (Version 5.3). Meta-analysis has two stages. First, a measure of treatment effect for each study with 95% confidence intervals (CIs) was computed. For continuous data, mean difference (MD) and standardized mean difference (SMD) were common measures used to report the magnitude of the treatment effect, and CI gave an idea of how precise the estimate was (Akobeng, 2005). When the studies evaluated the same outcome measures using the same scale, MD was used for effect size, but SMD was used when measuring with a different scale (Higgins & Green, 2008). Second, an overall treatment effect as a weighted average of the individualized summary statistics was computed. Usually more weight is assigned to the more precise studies, but the rules for assigning weights was based on our assumptions about the distribution of true effects (Borenstein et al., 2009). This study calculated SMD as an effect size or treatment effect used in Cochrane reviews and SMD, also known as Hedges' g in social sciences (Higgins & Green, 2008).

Synthesis of Results

"Any kind of variability among studies in a systematic review may be termed heterogeneity" (Higgins & Green, 2008, p. 276). For example, methodologic heterogeneity might occur when there is variability in study design and risk of bias. Therefore, it was important to identify and measure heterogeneity (Higgins & Green, 2008). I^2 tests were calculated to test heterogeneity. The following is a guide to interpret I^2 of heterogeneity: 0%-40%: might not be important; 30%-60%: moderate; 50%-90%: substantial; 75%-100%: considerable (Higgins & Green, 2008).

Table 1.
Characteristics of Individual Studies

Author	Year	Country	N	Types of Surgeries	Massage Type	Body Parts	Post of days 0	1	2	3	4	5	6	7	Duration per Session	Practitioner	Control Group	Pain	Anxiety	Other
							*One Session													
Dreyer et al.	2015	USA	127	Colorectal	Swedish massage	Pt's choice			*	*					20	MT	Routine care + social visit	NRS*	NRS*	Tension,* relaxation,* satisfaction/BP and HR*
Adachi et al.	2014	Japan	42†	Vitrectomy	Basic aromatherapy	Arm, back, shoulder, neck		*	*						10	RN	Routine care	FPS*		
Braun et al.	2012	Australia	146	Cardiac	Swedish massage	Pt's choice				*		*			20	RN, MT, PT	Routine care Rest time	VAS*	VAS*	Relaxation,* muscular tension,* satisfaction
Cutshall et al.	2010	USA	58	Cardiac	Swedish massage	Pt's choice			*						20	MT	Routine care	VAS*	VAS*	Tension,* satisfaction
Bauer, et al.	2010	USA	113	Cardiac	Integrative massage therapy	?			*		*				20	MT	Routine care	VAS*	VAS*	Tension,* satisfaction, respiratory rate*
Mitchinson et al.	2007	USA	403†	Sternal & abdominal	Integrative massage therapy	Back		*	*	*	*	*	~D/C		20	MT	Routine care	VAS*	VAS*	
Piotrowski et al.	2003	USA	136†	General & thoracic	Effleurage massage	Back		**	**	**	**	**	**	**	20	RN	Routine care	VAS*		
Taylor et al.	2003	USA	66†	Gynecologic (abdominal & laparoscopic)	Swedish massage	Whole body	*	*	*						45	MT	Routine care	VAS*	Spielberg State Anxiety Scores	24-hour urine free cortisol, VS, etc.
Hattan et al.	2002	UK	16†	Cardiac	From the International Therapy Examination Council Massage Course	Feet			* After day 2						20	MT	Routine care	VAS	VAS	Tension, relaxation, rest, calm*, VS
Stevensen	1994	UK	50†	Cardiac	Standardized foot massage	Feet		*							20	RN	Routine care		STAI*	Respiratory rate*

Pt = patient; MT = massage therapist; NRS = Numeric Rating Scale; BP = blood pressure; HR = heart rate; RN = registered nurse; PT = physical therapist; FPS = Faces Pain Scale; VAS = visual analogue scale; STAI = State Trait Anxiety Inventory; VS = Vital Signs.

*Statistically significant difference ($p < .05$).

†Additional intervention group exists.

Risk of Bias Across Studies

In a systematic review, publication bias should be considered because studies that find a significant effect of intervention are likely to be published, are easily identified, and are more likely to be included (Borenstein et al., 2009). To retrieve all relevant studies, different sources were searched, which included searching multiple electric databases to ensure identifying all the related studies and also to minimize bias for those that were found (Akobeng, 2005). In addition, two reviewers independently assessed the quality of the selected studies to avoid the risk of selection bias.

RESULTS

Study Selection

The electronic database search yielded a total of 905 records, and 36 studies were identified after screening of titles and abstracts. The full texts were evaluated by two independent researchers, and 26 studies were excluded for the following reasons: inappropriate population (e.g., outpatients or children), no data available after contacting the primary authors, inappropriate intervention (e.g., reflexology), inappropriate research design (e.g., quasiexperimental design), and inappropriate control group (e.g., therapeutic physical contact). As a result, 10 studies were included; the characteristics of individual studies are described in Table 1 (Adachi et al., 2014; Bauer et al., 2010; Braun et al., 2012; Cutshall et al., 2010; Dreyer et al., 2015; Hattan, King, & Griffiths, 2002; Mitchinson et al., 2007; Piotrowski et al., 2003; Stevensen, 1994; Taylor et al., 2003). Figure 1 shows the flow of the systematic review. Because a year had passed since the first database search, the same research librarian and the primary researcher repeated the database search, but no further studies were discovered.

Study Characteristics

All selected studies were RCTs and included control groups who received either routine care or routine care plus social visits or rest time. Six studies had an intervention group who received treatment other than massage therapy, such as aromatherapy. Studies were drawn from the United States, United Kingdom, Australia, and Japan. The total sample size was 1,157, and the participants were hospitalized patients who had undergone cardiac, thoracic, colorectal, gynecologic, and vitrectomy surgery. Their mean age range was between 54 and 68 years.

Risk of Bias within Studies

Two independent researchers analyzed the risk of bias within studies. All studies reported randomization, but 5 of the 10 studies did not report the randomization method. Only three studies addressed allocation concealment. Because the type of intervention makes blinding of participants and personnel difficult to implement, none of the studies implemented blinding procedures. Two studies, however, did implement blinding of outcome assessment. Five studies had more than three low risk values and five had fewer than three low risk values. The risk of bias summary is shown in Figure 2.

Results of Individual Studies

The selected studies included a variety of massage therapy methods, but most used Swedish massage. Studies variously described the pressure of the massage strokes as gentle, medium, or firm. In most studies, the therapy provider was a massage therapist; in a few studies, nurses provided the massage. The body areas that received massage included the back, feet, whole body, or the participant's choice of body area. The duration of the massage therapy was 10, 20, or 45 minutes. Massage dosages were once or twice daily until discharge or twice daily for 7 days. Massage therapy was initially administered at various times ranging between the day of surgery and the fifth day after surgery.

Nine studies investigated the effects of pain and used the visual analogue scale, Numeric Rating Scale (NRS), and Faces Pain Scale. Eight studies explored the effect of anxiety and evaluated this using the visual analogue scale, Numeric Rating Scale, and State-Trait Anxiety Inventory (STAI). Although most studies found that massage therapy had statistically significant effects on managing pain and anxiety compared with the control group, one small-sample study did not have significant results. None of the selected studies reported adverse effects. The characteristics of individual studies are shown in Table 1.

Synthesis of Results

To clarify the effects of massage therapy on postoperative pain and anxiety, a meta-analysis was performed. After SMD with 95% CIs using a random effect model was calculated in each study, an overall treatment effect was measured. Forest plots graphically indicate an estimate of the overall result (Fig. 3, overall pain; Fig. 4, overall anxiety). The CIs of both pain and anxiety in the included studies revealed much wider results, showing ranges from −1.87 to −0.08 (pain) and −2.77 to 0.10 (anxiety). A 95% CI describes the precision of the estimate of treatment effects, and the narrower the interval (e.g., 0.70-0.80), the more precise it is as it relates to large sample sizes (Higgins & Green, 2008). The direction is also important, and negative effect size indicates that the treatment is more likely to be favorable when the outcome is

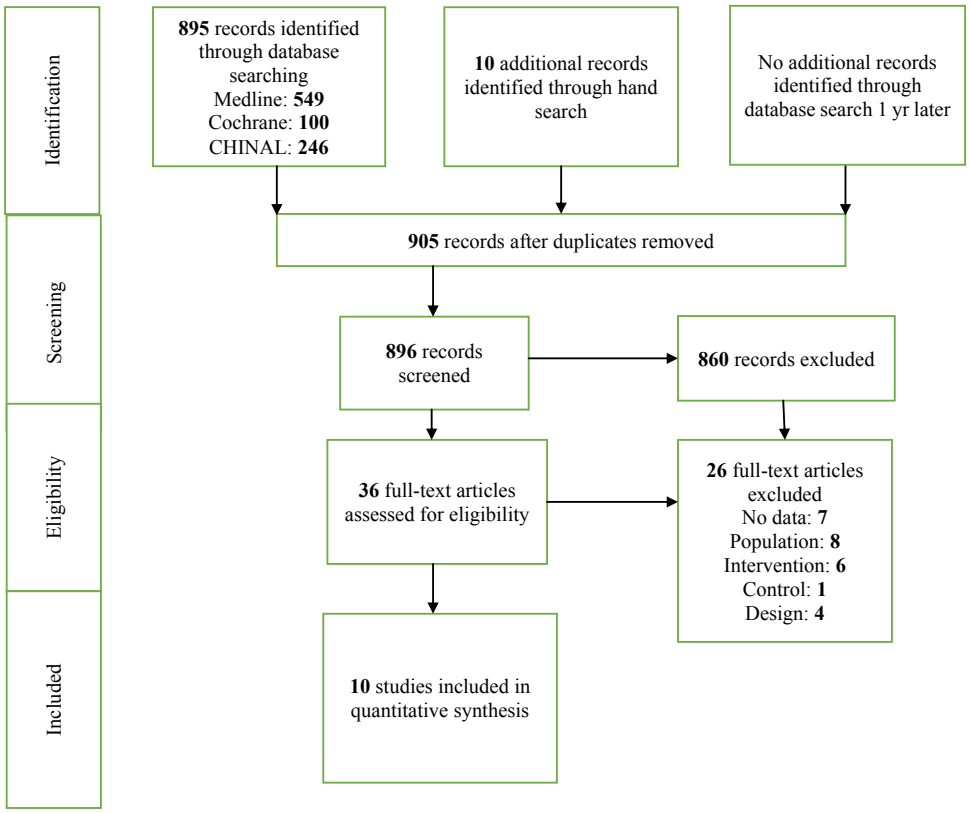

Figure 1. ■ Flow of the systematic review.

continuous. For instance, the 95% CI excludes the null value of 0.0, and if the p value is $< .05$, it represents a difference between groups (Borenstein et al., 2009). The interval of a few included studies in both pain and anxiety did not exclude the null value of 0.0. The results of overall treatment effects in the included studies indicated that the effect sizes of pain (−0.58) and of anxiety (−0.71) were moderate. There are some rules for interpreting SMDs, such as that 0.2 represents a small effect, 0.5 a moderate effect, and 0.8 a large effect, but the interpretation might be problematic unless the context also is interpreted thoroughly (Cohen, 1992; Higgins & Green, 2008). In addition, the results of this review identified substantial heterogeneity for pain ($p < .00001$, $I^2 = 85\%$) and anxiety ($p < .00001$, $I^2 = 86\%$).

Additional Analysis

Subgroup analysis is defined as splitting all the participant data into subgroups and comparing them to investigate heterogeneous results (Higgins & Green, 2008). Taking strategies for addressing the heterogeneity, a subgroup analysis was conducted on dosage (single vs. multiple), type of incision (sternal vs. abdominal), and quality of research for both pain and anxiety (Table 2). All subgroup analysis, other than single dose for pain and pain from sternal incision, indicated substantial heterogeneity.

Six studies assessed postoperative pain after a single dosage of massage therapy; the effect sizes were reasonably consistent from study to study, and they fell in the range of −0.4 to 0.9 (Fig. 5). Massage after a single dose was likely to have a moderate effect on pain (SMD −0.49, 95% CI −0.64, −0.34; $p < .00001$) and the heterogeneity was low ($p = .39$, $I^2 = 4\%$). Regarding the type of incision, Figure 6 shows the forest plot. Four studies investigated pain from sternal incisions (SMD −0.68, 95% CI −0.91, −0.46; $p = .76$) and had consistent effect sizes (SMD −0.60 to −0.90) and low heterogeneity ($p = .76$, $I^2 = 0\%$). These studies found significant improvement in pain after massage (SMD −0.68, 95% CI −0.91, −0.46; $p < .00001$). The findings on the forest plot in both single dosage and sternal incision indicated that the 2002 trial by Hattan et al. was an outlier in terms of the wide range of CI and that it probably was due to small sample sizes.

Risk of Bias Across Studies

We attempted to perform a comprehensive search of the literature to minimize bias, but publication bias could not be totally excluded. This review conducted only three database searches. In addition, availability

	(A) Random sequence generation	(B) Allocation concealment	(C) Blinding of participants and personnel	(D) Blinding of outcome assessment	(E) Incomplete outcome data	(F) Selective reporting	No. of low risk
Dreyer et al. (2015)	?	–	–	+	+	+	3
Adachi et al. (2014)	+	+	–	–	+	+	4
Braun et al. (2012)	+	–	–	–	+	+	3
Cutshall et al. (2010)	?	–	–	–	?	+	1
Bauer et al. (2010)	+	+	–	–	–	+	3
Mitchinson et al. (2007)	+	+	–	+	+	+	5
Piotrowski et al. (2003)	?	–	–	–	–	+	1
Taylor et al. (2003)	?	–	–	–	–	+	1
Hattan et al. (2002)	?	–	–	–	?	–	0
Stevensen (1994)	+	–	–	?	+	–	2

Figure 2. ■ Risk of bias summary. + = low risk; – = high risk; ? = unknown.

bias (the selective inclusion of studies that are easily accessible to the authors) should be considered (Borenstein et al., 2009). Some trials were excluded because data were not available even after contacting the primary researchers or the authors did not respond to our request. Only English language studies were included, which makes language bias a possibility.

DISCUSSION

Summary of Evidence

The database search yielded 10 trials addressing the effects of massage therapy on pain and/or anxiety after surgery. Substantial heterogeneity was noted, which instigated the process of a subgroup analysis. Six studies (n = 382) investigated the effects of a single dose of massage therapy with a duration of 10-20 minutes on postoperative pain, and the overall treatment effect was reported as effective. Four studies (n = 176) investigated the effect of pain for surgeries with sternal incision, including coronary artery bypass graft or valve replacement, and the overall treatment effect was also reported as effective.

Single Dosage. The finding of this review is not congruent with the evidence of Moyer et al. (2004), who conducted a meta-analysis (37studies/1,802 participants) of massage therapy studies on various populations and reported that a single dose of the intervention was not statistically effective for the immediate assessment of pain. However, the meta-

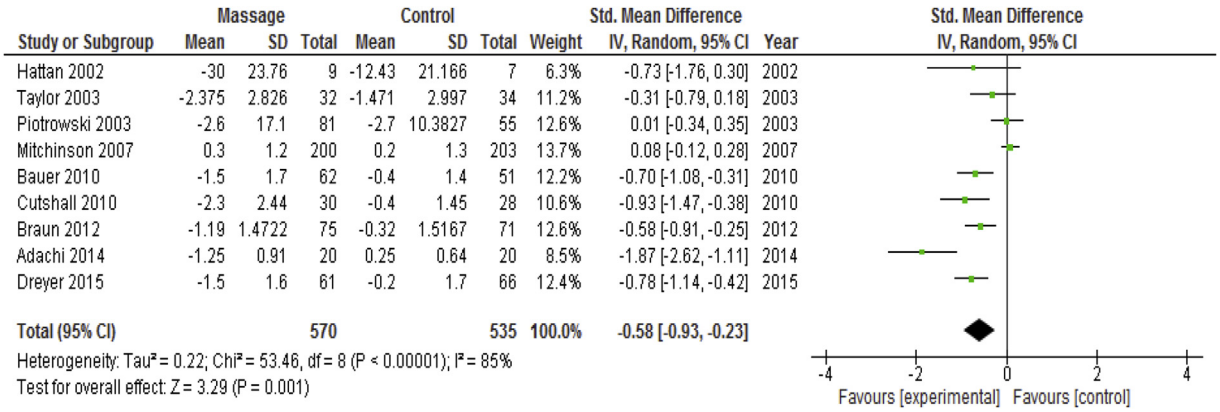

Figure 3. ■ Massage therapy for overall postoperative pain. Diamond = overall effect estimate; Mid-point of square = point effect estimate of each study; SD = standard deviation; IV = instrumental variable; CI = confidence interval.

analysis conducted by Moyer et al. (2004) included participants with different medical conditions (including a patient with a chronic condition), and they were all from a postoperative population. The magnitude of the effect of massage therapy on acute pain might be greater than on chronic pain.

Although massage therapy may have immediate pain-reducing effects, the effects are not long lasting, as suggested by previous research. Adams, White, and Beckett (2010) examined the effects of massage therapy on pain management in an acute care setting. The authors found that most patients experienced benefits from massage therapy for 1-4 hours. Lee et al. (2015) performed a meta-analysis of massage therapy for cancer pain including 559 participants with all types of cancer and found that massage significantly relieved the pain, particularly in the short term. Therefore, it would be appropriate to combine massage with other methods, including pain medication and other complementary modalities.

Heterogeneity. This review revealed substantial heterogeneity. Higgins, Thompson, Deeks, and Altman (2003) noted that heterogeneity describes the amount of total variation across the trials and it occurs above chance when there is diversity in participants, treatment, and study quality. For example, these studies featured different types of abdominal surgery, including colorectal and gynecologic operations that had both laparoscopic and open incisions. Accordingly, heterogeneity was likely to occur because of diversity in the moderator variables for abdominal surgery participants. Furthermore, the data from both abdominal and thoracic or sternal surgeries were combined and were not presented separately (Mitchinson et al., 2007; Piotrowski et al, 2003). Future clinical trials to investigate the effects of massage should at least use a uniform population or type of surgery to reduce the chance of heterogeneity for meta-analysis.

The present study evaluated the effects of anxiety using subgroup analysis, but all subgroups had high heterogeneity for anxiety. This review found substantial heterogeneity in some subgroups, which may have resulted from the diversity in massage interventions. The included trials varied in type of massage

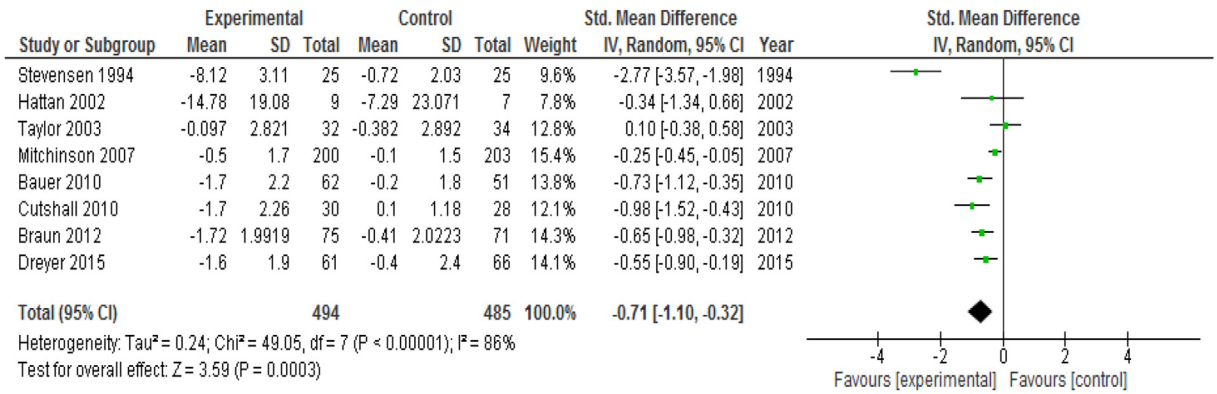

Figure 4. ■ Massage therapy for postoperative anxiety. Diamond = overall effect estimate; Mid-point of square = point effect estimate of each study; SD = standard deviation; IV = instrumental variable; CI = confidence.

Table 2.
Effect Sizes of Massage Therapy by Subgroup

Outcome	Factor	No. of Studies	No. of Participants	SMD (95% CI)	Test for Overall Effect *p* Value	I^2 (%)	Heterogeneity *p* Value
Pain	Overall	9	1,105	−0.58 [−0.93, −0.23]	.001	85	.00001
	Single dose	6	757	−0.49 [−0.64, −0.34]	.00001	4	.39
	Multiple dose	7	1,031	−0.53 [−0.91, −0.14]	.007	87	.00001
	Sternal	4	333	−0.68 [−0.91, −0.46]	.00001	0	.76
	Abdominal	2	193	−0.57 [−1.04, −0.11]	.02	58	.12
	Research quality: High	5	829	−0.70 [−1.22, −0.18]	.009	91	.00001
	Research quality: Low	4	276	−0.42 [−0.88, −0.04]	.07	66	.03
Anxiety	Overall	8	979	−0.71 [−1.10, −0.32]	.00003	86	.00001
	Single dose	6	1,154	−0.82 [−1.31, −0.32]	.001	87	.00001
	Multiple dose	5	855	−0.43 [−0.69, −0.17]	.001	67	.02
	Sternal	5	401	−2.96 [−4.86, −1.06]	.002	93	.00001
	Abdominal	2	193	−0.57 [−2.01, −0.86]	.43	71	.06
	Research quality: High	4	982	−0.51 [−0.76, −0.26]	.00001	61	.05
	Research quality: Low	4	979	−0.71 [−1.10, −0.32]	.00003	86	.00001

SMD = standardized mean difference; CI = confidence interval.

therapy, pressure, body parts treated, frequency, duration, and practitioner. Unlike the systematic phase-wise approach of drug trials, an adequate dosage has not been established in typical massage trials (Ezzo, 2007), and further studies are recommended to establish the optimal dosage (Ezzo, Myer, & Bronfort, 2007). Furthermore, the type of massage varied across studies. Four studies provided Swedish massage, and other studies used techniques that could not be easily categorized. Ezzo (2007) pointed out that *massage* is an umbrella term that incorporates about 100 different types of modality, and a massage taxonomy is recommended to create a common language among researchers in the future.

Cardiac Surgery. The findings of this review reinforce the evidence that massage therapy might be effective for patients after cardiac surgery, as many researchers conducted trials and accumulated evidence. For instance, Halm (2015) examined 10 studies (a total of 1,768 participants) that investigated the effects of massage therapy on cardiac surgery patients. The results were deduced to be level B evidence as accorded by the American Association of Critical-Care Nurses evidence-leveling system (Armola et al, 2009), which advocates well-designed controlled studies that consistently support a specific action. Patients' comments were explored by Martorella, Boitor, Michaud, and Gelinas (2014). They conducted semistructured interviews for cardiac surgery patients who received massage therapy, and 43 participants (83%) commented that the intervention was good, helpful, and relieving, stating that "after the surgery, it is so good that someone is taking care of you" (p. 440). Patients who underwent cardiac surgery experienced postoperative discomfort in the back, shoulders, and neck (Anderson & Cutshall, 2007) resulting from sternal incisions, insertion of chest tubes, and intraoperative retraction and dissection of chest wall tissue (Mueller et al., 2000). Cardiac surgery patients might receive the benefits from massage therapy because of its possible analgesic effect.

Massage therapy for cardiac surgery has been well established to some degree and has become a role model or a leading area among other surgeries. Cardiac surgery patients are already provided with massage therapy at the Mayo Clinic in the United States (Anderson & Cutshall, 2007; Cutshall et al., 2007; Wang, Sundt, Cutshall, & Bauer, 2010). Anderson and Cutshall (2007) conducted a patient satisfaction survey at a large Midwest medical center and reported overwhelming positive outcomes and comments from cardiac surgery patients who received massage therapy for pain management. Some studies investigated the feasibility of CAM therapies or massage therapy and discovered that

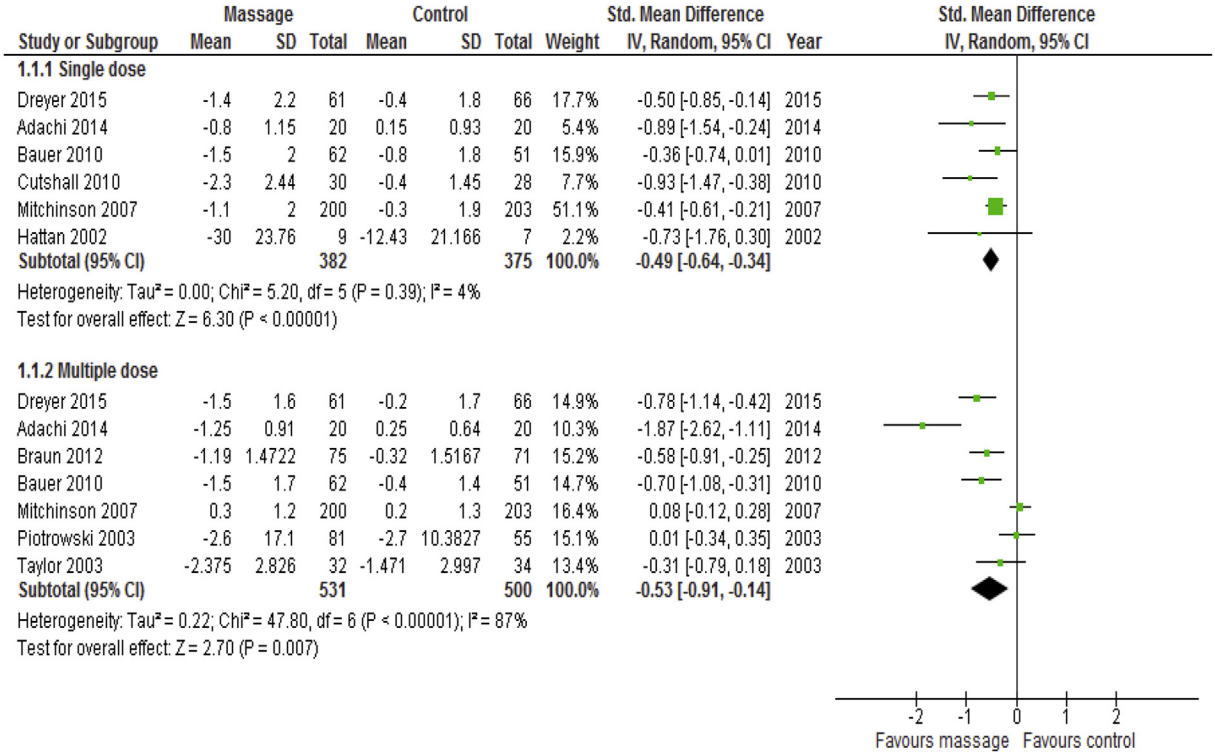

Figure 5. ■ Dosage of massage therapy for postoperative pain. Area of square = weight given to the study; Diamond = overall effect estimate; Mid-point of square = point effect estimate of each study; SD = standard deviation; IV = instrumental variable; CI = confidence interval.

implementing either therapy is feasible, but one of the barriers to practice the treatment was lack of support from health care professionals (Kshettry, Carole, Henly, Sendelbach, & Kummer, 2006; Martorella et al., 2014). The healing enhancement program, which included massage therapy within cardiovascular surgery, was successful at the Mayo Clinic because of collaborative efforts from health care workers (Cutshall et al., 2007). If nurses accept the therapy, the program will be promoted (Martorella, et al., 2014).

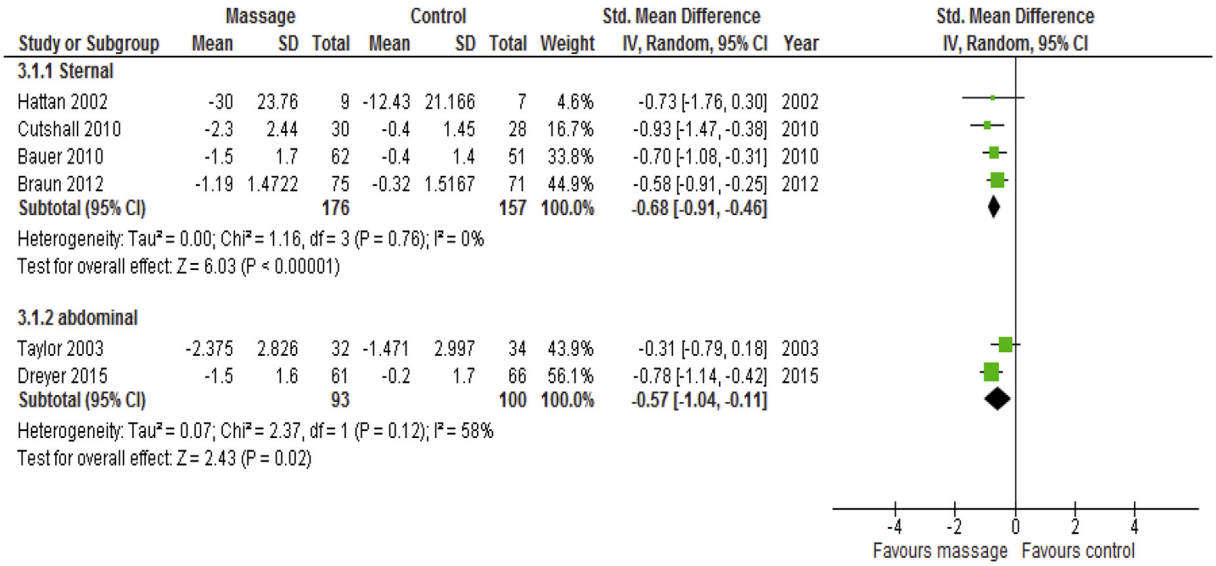

Figure 6. ■ The type of incision of massage therapy for postoperative pain. Area of square = weight given to the study; Diamond = overall effect estimate; Mid-point of square = point effect estimate of each study; SD = standard deviation; IV = instrumental variable; CI = confidence interval.

Limitations

There were some methodologic limitations of the included trials. Lundh and Gotzsche (2008) have stated that systematic reviews are better than narrative reviews because they can reduce bias (such as selection and detection bias) in controlled clinical studies. However, if the data in individual trials are flawed, the conclusions of a systematic review would be unreliable. First, double blinding is difficult in massage research (Cawley, 1997; Ernst, 2009; Ezzo, 2007; Ezzo et al., 2007; Lee et al., 2015), and none of the studies met the double-blinding criterion. The blinding of practitioners is impossible in massage trials, and it is difficult to blind participants. Lack of blinding can lead to detection bias, which can bias outcome assessment (Lundh & Gotzsche, 2008). Some researchers have explored the use of a sham massage or even a very light touch control, but there may be some physiologic effects of touch alone, and it is not appropriate for a true placebo (Ezzo, 2007). At the very least, the outcomes assessor and statistician should always be blinded (Ezzo et al., 2007).

Second, selection bias is defined as differences in baseline characteristics between groups (Lundh & Gotzsche, 2008). The present review identified bias in some of the included studies. For instance, eight studies specified participant gender, but one study did not (Stevensen, 1994). Some studies included only female participants, and one study included mostly male veterans. One previous study suggests that men tend to experience more benefits from massage therapy than women (Labyak & Metzger, 1997).

Third, detection bias is a concern for individual trials. During the postoperative period, patients experience pain, anxiety, and fatigue, but symptoms decrease with time and recovery occurs. The appropriate time at which to provide postoperative intervention is not yet clear, and future studies are required. There was substantial diversity in intervention in terms of frequency, duration, number of sessions, and massage techniques, as noted in previous work (Ezzo et al., 2007; Lee et al., 2015; Pan et al., 2014), which thereby creates a concern over the quality of methodology. Therefore, the present findings should be interpreted and generalized carefully, and additional research evidence is needed regarding the effects of massage on postoperative pain and anxiety.

CONCLUSIONS

To our knowledge, there are only two systematic reviews (Papathanassoglou & Mpouzika, 2012; Richards, Gibson, & Overton-McCoy, 2000) analyzing the effects of massage or touch on acute or critical care patents. This is the first meta-analysis to investigate the effect of massage therapy specific to postoperative patients. The findings of this meta-analysis suggest that massage therapy for postoperative pain may have a short-term positive effect, and it could also be part of a multimodal pain management regimen for postoperative patients. This study also concluded that pain resulting from cardiovascular surgery was relieved by using massage therapy, and some institutions have already introduced massage therapy into their cardiovascular surgery program. Many patients appreciated the intervention. Nurses hold an important role in introducing and maintaining the massage therapy program because collaborative work is necessary for its success. Another approach is that nurses themselves learn the skill and practice it at bedside. Therefore, it would be important to integrate massage into basic preparation in schools of nursing. In Sweden, Cronfalk, Friedrichesen, Milberg, and Strang (2008) evaluated a 1-day education class of soft tissue massage for palliative care nurses and concluded that hospital organizations may be encouraged to introduce classes teaching soft tissue massage. Acquiring massage skills not only enhances comfortable nursing skills at bedside but also establishes a trusting relationship with their patients (Henricson, Berglund, Maatta, & Segesten, 2006).

Implications for Further Research

Rubin, Hardy, and Hotopf (2004) found that postoperative fatigue is common after major abdominal, gynecologic, and cardiac surgery as a result of the invasive processes of anesthesia and surgery. During the recovery process, patients may be very fragile and sensitive. Therefore, the pressure of massage therapy should be considered. In the included studies, there was a variety of pressure applied and referred to as gentle, medium, or firm. However, in some studies, pressure was not mentioned at all. Field, Diego, and Hernandez-Reif (2010) argued that stress was reduced in adults when moderate-pressure massage was applied. On the other hand, Billhult and Maatta (2009) discovered that patients with severe anxiety were relaxed when light-pressure massage was applied. The appropriate pressure for postoperative patients still remains unanswered. Postoperative patients should also be concerned about complications such as deep vein thrombosis and lymphedema, and some adjustments, such as pressure and site, are important (MacDonald, 2014). For future studies, the detailed methods of massage intervention, such as appropriate pressure and site of massage therapy for postoperative patients, should be explored.

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