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Smith CA, Levett KM, Collins CT, Dahlen HG, Ee CC, Suganuma M

Smith CA, Levett KM, Collins CT, Dahlen HG, Ee CC, Suganuma M.
Massage, reflexology and other manual methods for pain management in labour.
Cochrane Database of Systematic Reviews 2018, Issue 3. Art. No.: CD009290.
DOI: 10.1002/14651858.CD009290.pub3.

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TABLE OF CONTENTS

HEADER 1
ABSTRACT 1
PLAIN LANGUAGE SUMMARY 2
SUMMARY OF FINDINGS 4
BACKGROUND 10
OBJECTIVES 12
METHODS 12
RESULTS 16
Figure 1. 17
Figure 2. 20
Figure 3. 21
DISCUSSION 26
AUTHORS' CONCLUSIONS 27
ACKNOWLEDGEMENTS 27
REFERENCES 28
CHARACTERISTICS OF STUDIES 34
DATA AND ANALYSES 58
Analysis 1.1. Comparison 1 Massage versus usual care, Outcome 1 Pain intensity. 59
Analysis 1.2. Comparison 1 Massage versus usual care, Outcome 2 Sense of control in labour. 60
Analysis 1.3. Comparison 1 Massage versus usual care, Outcome 3 Sense of control in labour (shortened Labour Agentry Scale). 60
Analysis 1.4. Comparison 1 Massage versus usual care, Outcome 4 Satisfaction with childbirth experience. 60
Analysis 1.5. Comparison 1 Massage versus usual care, Outcome 5 Satisfaction with childbirth experience. 61
Analysis 1.6. Comparison 1 Massage versus usual care, Outcome 6 Assisted vaginal birth. 61
Analysis 1.7. Comparison 1 Massage versus usual care, Outcome 7 Caesarean section. 61
Analysis 1.8. Comparison 1 Massage versus usual care, Outcome 8 Admission to neonatal intensive care unit. 62
Analysis 1.9. Comparison 1 Massage versus usual care, Outcome 9 Apgar score < 7 at 5 mins. 62
Analysis 1.10. Comparison 1 Massage versus usual care, Outcome 10 Use of pharmacological pain relief. 62
Analysis 1.11. Comparison 1 Massage versus usual care, Outcome 11 Length of labour (minutes). 62
Analysis 1.12. Comparison 1 Massage versus usual care, Outcome 12 Need for augmentation with oxytocin. 63
Analysis 1.13. Comparison 1 Massage versus usual care, Outcome 13 Perineal trauma. 63
Analysis 1.14. Comparison 1 Massage versus usual care, Outcome 14 Postpartum haemorrhage. 64
Analysis 1.15. Comparison 1 Massage versus usual care, Outcome 15 Women's emotional experience of the intervention (reduced anxiety) in labour. 64
Analysis 1.16. Comparison 1 Massage versus usual care, Outcome 16 Spontaneous vaginal birth (not pre-specified). 64
Analysis 1.17. Comparison 1 Massage versus usual care, Outcome 17 Resuscitation of newborn (not pre-specified). 65
Analysis 2.1. Comparison 2 Warm pack versus usual care, Outcome 1 Pain intensity. 65
Analysis 2.2. Comparison 2 Warm pack versus usual care, Outcome 2 Length of labour (minutes). 66
Analysis 3.1. Comparison 3 Thermal manual methods versus usual care, Outcome 1 Pain intensity. 67
Analysis 3.2. Comparison 3 Thermal manual methods versus usual care, Outcome 2 Assisted vaginal birth. 68
Analysis 3.3. Comparison 3 Thermal manual methods versus usual care, Outcome 3 Length of labour (minutes). 68
Analysis 3.4. Comparison 3 Thermal manual methods versus usual care, Outcome 4 Need for augmentation with oxytocin. 69
Analysis 3.5. Comparison 3 Thermal manual methods versus usual care, Outcome 5 Episiotomy. 69
Analysis 3.6. Comparison 3 Thermal manual methods versus usual care, Outcome 6 First degree tear (not pre-specified). 70
Analysis 4.1. Comparison 4 Massage versus music, Outcome 1 Pain intensity. 70
Analysis 4.2. Comparison 4 Massage versus music, Outcome 2 Use of pharmacological pain relief. 71
APPENDICES 71
WHAT'S NEW 74
CONTRIBUTIONS OF AUTHORS 74
DECLARATIONS OF INTEREST 74
SOURCES OF SUPPORT 75

DIFFERENCES BETWEEN PROTOCOL AND REVIEW 75
NOTES 75
INDEX TERMS 75

[Intervention Review]

Massage, reflexology and other manual methods for pain management in labour

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Editorial group: Cochrane Pregnancy and Childbirth Group
Publication status and date: New search for studies and content updated (no change to conclusions), published in Issue 3, 2018.

Citation: Smith CA, Levett KM, Collins CT, Dahlen HG, Ee CC, Suganuma M. Massage, reflexology and other manual methods for pain management in labour. *Cochrane Database of Systematic Reviews* 2018, Issue 3. Art. No.: CD009290. DOI: 10.1002/14651858.CD009290.pub3.

ABSTRACT

Background

Many women would like to avoid pharmacological or invasive methods of pain management in labour, and this may contribute towards the popularity of complementary methods of pain management. This review examined the evidence currently available on manual methods, including massage and reflexology, for pain management in labour. This review is an update of the review first published in 2012.

Objectives

To assess the effect, safety and acceptability of massage, reflexology and other manual methods to manage pain in labour.

Search methods

For this update, we searched Cochrane Pregnancy and Childbirth's Trials Register (30 June 2017), the Cochrane Central Register of Controlled Trials (CENTRAL; 2017, Issue 6), MEDLINE (1966 to 30 June 2017, CINAHL (1980 to 30 June 2017), the Australian New Zealand Clinical Trials Registry (4 August 2017), Chinese Clinical Trial Registry (4 August 2017), ClinicalTrials.gov, (4 August 2017), the National Center for Complementary and Integrative Health (4 August 2017), the WHO International Clinical Trials Registry Platform (ICTRP) (4 August 2017) and reference lists of retrieved trials.

Selection criteria

We included randomised controlled trials comparing manual methods with standard care, other non-pharmacological forms of pain management in labour, no treatment or placebo. We searched for trials of the following modalities: massage, warm packs, thermal manual methods, reflexology, chiropractic, osteopathy, musculo-skeletal manipulation, deep tissue massage, neuro-muscular therapy, shiatsu, tuina, trigger point therapy, myotherapy and zero balancing. We excluded trials for pain management relating to hypnosis, aromatherapy, acupuncture and acupressure; these are included in other Cochrane reviews.

Data collection and analysis

Two review authors independently assessed trial quality, extracted data and checked data for accuracy. We contacted trial authors for additional information. We assessed the quality of the evidence using the GRADE approach.

Main results

We included a total of 14 trials; 10 of these (1055 women) contributed data to meta-analysis. Four trials, involving 274 women, met our inclusion criteria but did not contribute data to the review. Over half the trials had a low risk of bias for random sequence generation and attrition bias. The majority of trials had a high risk of performance bias and detection bias, and an unclear risk of reporting bias. We found no trials examining the effectiveness of reflexology.

Massage

We found low-quality evidence that massage provided a greater reduction in pain intensity (measured using self-reported pain scales) than usual care during the first stage of labour (standardised mean difference (SMD) −0.81, 95% confidence interval (CI) −1.06 to −0.56, six trials, 362 women). Two trials reported on pain intensity during the second and third stages of labour, and there was evidence of a reduction in pain scores in favour of massage (SMD −0.98, 95% CI −2.23 to 0.26, 124 women; and SMD −1.03, 95% CI −2.17 to 0.11, 122 women). There was very low-quality evidence showing no clear benefit of massage over usual care for the length of labour (in minutes) (mean difference (MD) 20.64, 95% CI −58.24 to 99.52, six trials, 514 women), and pharmacological pain relief (average risk ratio (RR) 0.81, 95% CI 0.37 to 1.74, four trials, 105 women). There was very low-quality evidence showing no clear benefit of massage for assisted vaginal birth (average RR 0.71, 95% CI 0.44 to 1.13, four trials, 368 women) and caesarean section (RR 0.75, 95% CI 0.51 to 1.09, six trials, 514 women). One trial reported less anxiety during the first stage of labour for women receiving massage (MD -16.27, 95% CI −27.03 to −5.51, 60 women). One trial found an increased sense of control from massage (MD 14.05, 95% CI 3.77 to 24.33, 124 women, low-quality evidence). Two trials examining satisfaction with the childbirth experience reported data on different scales; both found more satisfaction with massage, although the evidence was low quality in one study and very low in the other.

Warm packs

We found very low-quality evidence for reduced pain (Visual Analogue Scale/VAS) in the first stage of labour (SMD −0.59, 95% CI −1.18 to −0.00, three trials, 191 women), and the second stage of labour (SMD −1.49, 95% CI −2.85 to −0.13, two trials, 128 women). Very low-quality evidence showed reduced length of labour (minutes) in the warm-pack group (MD −66.15, 95% CI −91.83 to −40.47; two trials; 128 women).

Thermal manual methods

One trial evaluated thermal manual methods versus usual care and found very low-quality evidence of reduced pain intensity during the first phase of labour for women receiving thermal methods (MD −1.44, 95% CI −2.24 to −0.65, one trial, 96 women). There was a reduction in the length of labour (minutes) (MD −78.24, 95% CI −118.75 to −37.73, one trial, 96 women, very low-quality evidence). There was no clear difference for assisted vaginal birth (very low-quality evidence). Results were similar for cold packs versus usual care, and intermittent hot and cold packs versus usual care, for pain intensity, length of labour and assisted vaginal birth.

Music

One trial that compared manual methods with music found very low-quality evidence of reduced pain intensity during labour in the massage group (RR 0.40, 95% CI 0.18 to 0.89, 101 women). There was no evidence of benefit for reduced use of pharmacological pain relief (RR 0.41, 95% CI 0.16 to 1.08, very low-quality evidence).

Of the seven outcomes we assessed using GRADE, only pain intensity was reported in all comparisons. Satisfaction with the childbirth experience, sense of control, and caesarean section were rarely reported in any of the comparisons.

Authors' conclusions

Massage, warm pack and thermal manual methods may have a role in reducing pain, reducing length of labour and improving women's sense of control and emotional experience of labour, although the quality of evidence varies from low to very low and few trials reported on the key GRADE outcomes. Few trials reported on safety as an outcome. There is a need for further research to address these outcomes and to examine the effectiveness and efficacy of these manual methods for pain management.

PLAIN LANGUAGE SUMMARY

Massage, reflexology and other manual methods for managing pain in labour

What is the issue?

This Cochrane review looked at whether massage, reflexology and other manual therapies would help with reducing pain and improve women's experiences of childbirth. We collected and analysed all the relevant trials to answer this question (search date: 30 June 2017).

Why is this important?

The pain of labour can be intense, with tension, anxiety and fear making it worse. Many women would like to labour without using drugs such as narcotics or epidurals, and are interested in complementary therapies to help them manage the pain of labour.

In this review we have looked to see if massage, reflexology and other manual methods are effective. Other complementary therapies like acupuncture, mind-body techniques, hypnosis and aromatherapy have been studied in other Cochrane reviews. Massage involves manipulating the body's soft tissues and it can be done by the midwife or partner. It helps women relax and so reduces tension which in turn may reduce pain in labour. Reflexology is gentle manipulation or pressing on certain parts of the foot to produce an effect elsewhere in the body. Other manual methods include warm packs, osteopathy, shiatsu and zero balancing. It is important to examine if these therapies work and are safe, to enable women to make informed decisions about their care.

What evidence did we find?

This updated review now includes 14 trials. We were able to use data from 10 of the trials, involving a total of 1055 women. We found no trials on reflexology, osteopathy, shiatsu and zero balancing therapy.

In the various included trials, massage was given either by the woman's birth companion, a student midwife, a physiotherapist or a massage therapist (though some trials did not report who gave the massage). Three trials involved a two- to three-hour prebirth course attended by women and their partners, and delivered by a qualified practitioner. In three trials, the intervention was delivered by a qualified health practitioner (massage therapist, physiotherapist or nurse/researcher with unspecified qualifications). In one trial, nurses taught women's partners in the labour ward. There was insufficient reporting of the qualifications of the practitioner teaching massage.

We found that massage and thermal packs, in comparison to usual care or music, may help women manage labour pain intensity during the first stage when the cervix is dilating. However, the quality of this evidence was very low. The effects of massage on assisted vaginal birth, caesarean section rate, the length of labour and use of drugs for pain relief were less clear, and the quality of the evidence was also very low. Two small trials showed increased satisfaction with childbirth, and a greater sense of control for women receiving massage.

Warm packs were associated with reduced pain in the first stage of labour and reduced length of labour (very low-quality evidence).

What does this mean?

Massage may help women cope with pain in labour and may give them a better birth experience, and warm packs and thermal methods may help with pain. However, the quality of the evidence was generally low or very low, partly due to the trials being small and without sufficient numbers of women participating. These findings highlight a need for further research on this topic.

Summary of findings for the main comparison. Massage compared to usual care for pain management in labour

Massage compared to usual care for pain management in labour

Patient or population: women in labour
Setting: hospital settings in Australia, Brazil, Canada, Iran, Taiwan, UK
Intervention: massage
Comparison: usual care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants ( )	Certainty of the evidence (GRADE)	Comments
	Risk with usual care	Risk with massage				
Pain intensity — first stage of labour	-	The mean pain score in the massage group was 0.81 standard deviations lower (1.06 lower to 0.56 lower)	-	362 (6 RCTs)	⊕⊕⊖⊖ LOW [1 2]	Lower pain scores = less pain
Sense of control in labour Seven point scale, 29 items range '1=almost always', to '7=rarely'	The mean sense of control in labour was 150.92	MD 14.05 higher (3.77 higher to 24.33 higher)	-	124 (1 RCT)	⊕⊕⊖⊖[3] LOW	High score more control
Sense of control in labour (shortened Labour Agentry Scale). Seven point scale range '1=almost always', to '7=rarely'	The mean sense of control in labour (shortened Labour Agentry Scale) was 33.6	MD 6.1 lower (11.68 lower to 0.52 lower)	-	56 (1 RCT)	⊕⊕⊖⊖ LOW [2 4]	Low score more positive
Satisfaction with childbirth experience. Five point scale, 5=more satisfaction	The mean satisfaction with childbirth experience was 3.7	MD 0.47 higher (0.13 lower to 1.07 higher)	-	60 (1 RCT)	⊕⊖⊖⊖ VERY LOW [2 5]	Higher score indicates greater satisfaction
Satisfaction with childbirth experience	Study population		RR 1.90 (1.07 to 3.38)	60 (1 RCT)	⊕⊕⊖⊖ LOW [2 4]	
	333 per 1000	633 per 1000				

		(357 to 1000)			
Assisted vaginal birth	Study population		RR 0.71 (0.44 to 1.13)	368 (4 RCTs)	⊕⊖⊖⊖ VERY LOW [1 2 6]
	191 per 1000	136 per 1000 (84 to 216)			
Caesarean section	Study population		RR 0.75 (0.51 to 1.09)	514 (6 RCTs)	⊕⊖⊖⊖ VERY LOW [1 2 6]
	191 per 1000	144 per 1000 (98 to 209)			
Use of pharmacological pain relief	Study population		RR 0.81 (0.37 to 1.74)	368 (4 RCTs)	⊕⊖⊖⊖ VERY LOW [1 2 6]
	568 per 1000	460 per 1000 (210 to 989)			
Length of labour (minutes)	The mean length of labour was 547.25 minutes	MD 20.64 minutes higher (58.24 lower to 99.52 higher)	-	514 (6 RCTs)	⊕⊖⊖⊖ VERY LOW [1 2 6 7]

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio; **OR:** Odds ratio

GRADE Working Group grades of evidence
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect
Moderate certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

[1] Downgraded one level due to massage being given for the first time during the trial by untrained personnel (indirectness).
[2] Downgraded one level due to design limitations being present in most trials.
[3] Downgraded two levels due to a single study with a small sample size.
[4] Downgraded one level due to small sample size.
[5] Downgraded two levels due to small sample size and wide confidence intervals that cross the line of no effect.
[6] Downgraded one level due to wide confidence intervals that cross the line of no effect.
[7] Downgraded one level due to high statistical heterogeneity.

Summary of findings 2. Warm pack compared to usual care for pain management in labour

Warm pack compared to usual care for pain management in labour

Patient or population: women in labour
Setting: hospital settings in Iran
Intervention: warm pack
Comparison: usual care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with usual care	Risk with warm pack				
Pain intensity — first stage of labour	-	The mean pain score in the warm pack group was 0.59 standard deviations lower (1.18 lower to 0.00)	-	191 (3 RCTs)	⊕⊖⊖⊖ VERY LOW [1 2 3]	Low scores = less pain
Sense of control in labour — not reported	-	-	-	-	-	
Satisfaction with childbirth experience — not reported	-	-	-	-	-	
Assisted vaginal birth — not reported	-	-	-	-	-	
Caesarean section — not reported	-	-	-	-	-	
Use of pharmacological pain relief — not reported	-	-	-	-	-	
Length of labour: minutes	The mean length of labour was 246.88 minutes	MD 66.15 minutes lower (91.83 lower to 40.47 lower)	-	128 (2 RCTs)	⊕⊖⊖⊖ VERY LOW [4 5]	

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio; **OR:** Odds ratio

GRADE Working Group grades of evidence
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect
Moderate certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

[1] Downgraded two levels due to serious design limitations in two trials contributing 66.9% weight to final analysis. One other trial with design limitations.
[2] Downgraded two levels due to small sample size and wide confidence intervals just touching the line of no effect.
[3] Downgraded one level due to high statistical heterogeneity.
[4] Downgraded two levels due to one trial with serious design limitations contributing 68.4% weight to final analysis. One other trial with design limitations.
[5] Downgraded one level due to small sample size.

Summary of findings 3. Thermal manual methods compared to usual care for pain management in labour

Thermal manual methods compared to usual care for pain management in labour

Patient or population: women in labour
Setting: hospital in Iran
Intervention: thermal manual methods
Comparison: usual care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with usual care	Risk with thermal manual methods				
Pain intensity - first stage of labour	The mean pain intensity was 6.9	MD 1.44 lower (2.24 lower to 0.65 lower)	-	96 (1 RCT)	⊕⊖⊖⊖ VERY LOW [1 2]	Low score = less pain
Sense of control in labour — not reported	-	-	-	-	-	
Satisfaction with childbirth experience — not reported	-	-	-	-	-	
Assisted vaginal birth	Study population		RR 0.52 (0.08 to 3.54)	96 (1 RCT)	⊕⊖⊖⊖ VERY LOW [1 3]	
	31 per 1000	16 per 1000 (3 to 111)				
Caesarean section — not reported	-	-	-	-	-	
Use of pharmacological pain relief — not reported	-	-	-	-	-	

Length of labour: minutes	The mean length of labour was 273 minutes	MD 78.24 minutes lower (118.75 lower to 37.73 lower)	-	96 (1 RCT)	⊕⊖⊖⊖ VERY LOW [1,2]

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio; **OR:** Odds ratio

GRADE Working Group grades of evidence
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect
Moderate certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

[1] Downgraded two levels due serious design limitations in one trial contributing data.
[2] Downgraded one level due to small sample size.
[3] Downgraded two levels due to small sample size, few events and wide confidence intervals that cross the line of no effect.

Summary of findings 4. Massage compared to music for pain management in labour

Massage compared to music for pain management in labour

Patient or population: women in labour
Setting: hospital in Iran
Intervention: Massage
Comparison: music

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with music	Risk with massage				
Pain intensity "severe pain reported"	Study population		RR 0.40 (0.18 to 0.89)	101 (1 RCT)	⊕⊖⊖⊖ VERY LOW [1,2]	
	340 per 1000	136 per 1000 (61 to 303)				
Sense of control in labour — not reported	-	-	-	-	-	
Satisfaction with childbirth experience — not reported	-	-	-	-	-	

Assisted vaginal birth — not reported	-	-	-	-	-
Caesarean section — not reported	-	-	-	-	-
Use of pharmacological pain relief	Study population		RR 0.41 (0.16 to 1.08)	101 (1 RCT)	⊕⊖⊖⊖ VERY LOW [1] [3]
	240 per 1000	98 per 1000 (38 to 259)			
Length of labour — not reported	-	-	-	-	-

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio; **OR:** Odds ratio

GRADE Working Group grades of evidence
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect
Moderate certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

[1] Downgraded one level for design limitations in one trial contributing data.
[2] Downgraded two levels for small sample size and few events.
[3] Downgraded two levels for small sample size, few events, and wide confidence intervals just crossing the line of no effect.

BACKGROUND

This review is one in a series of Cochrane reviews examining pain management in labour. An earlier version of this review contributed to an overview of systematic reviews of pain management for women in labour (Jones 2012) and shared a generic protocol (Jones 2011).

Description of the condition

Labour presents a physiological and psychological challenge for women. As labour becomes more imminent, this can be a time of conflicting emotions; fear and apprehension can be coupled with excitement and happiness. Pain associated with labour has been described as one of the most intense forms of pain that can be experienced (Melzack 1984), although conversely some women do not experience intense pain during labour. Labour involves three stages, relating to dilation of the cervix, birth of the baby and delivery of the placenta. The latent phase is the early part of labour when there are irregular contractions and little cervical dilation. The first stage of labour consists of regular contractions with increasing strength and frequency accompanied by more significant cervical dilation of at least 4 cm to 6 cm. Transition may or may not be observable anywhere between 7 cm to 8 cm and full dilation. The second stage of labour commences from full cervical dilation to the birth of the baby. The third stage of labour involves expulsion of the placenta.

The pain experienced by women in labour is caused by uterine contractions, the dilatation of the cervix and, in the late first stage and second stage, by stretching of the vagina and pelvic floor to accommodate the baby. Tension, anxiety and fear are factors contributing towards women's perception of pain and may also affect their labour and birth experience (Buckley 2003; Buckley 2015). The neuromatrix theory of pain understands the influence of many factors including past experience and memory (Melzack 2001; Seifert 2011; Trout 2004). In labour the theory of pain incorporates elements of the gate control theory, but also past experiences, cultural factors, emotional state, cognitive input, stress regulation and immune systems, as well as immediate sensory input (Buckley 2015; Trout 2004).

Effective and satisfactory pain management needs to be individualised for each woman, and may be influenced by two paradigms: 'working with pain', or 'pain relief' (Leap 1997; Leap 2010). The 'working with pain' paradigm includes the belief that there are long-term benefits to promoting normal birth, and that pain plays an important role in this process. This approach offers support and encouragement to women, advocates the use of techniques such as immersion in water, comfortable positions and self-help techniques to cope with normal labour pain. The 'pain relief' paradigm is characterised by the belief that no woman need suffer pain in labour and women are offered a variety of pharmacological pain relief options. However, the complete removal of pain does not necessarily mean a more satisfying birth experience for women (Morgan 1982). A follow-up trial at five years after birth found those women who had epidurals were less positive about the birth five years later (Maimburg 2016).

The relationship between childbirth satisfaction, labour pain and analgesia is complex (Hodnett 2002). A systematic review by Hodnett 2002, which included two large population surveys, found that women who were very anxious about labour pain prenatally were less satisfied after the birth; and, secondly, women who were most satisfied were those who did not use pharmacological pain relief during labour. On the other hand, further trials indicate that women who experienced less labour pain report higher levels of childbirth satisfaction compared with women who report higher pain levels in labour (Waldenstrom 1999; Windridge 1999). However, labour pain is only one factor related to satisfaction with childbirth. Personal control and decision making are also related to satisfaction with the childbirth experience (Goodman 2004; Hodnett 2002; Martin 2013), and trials highlighted by (Leap 2010) describe women's experience of childbirth as difficult yet empowering, leading to achievement and a feeling of pride in their ability to cope with intense pain (Lundgren 1998; McCrea 2000; Niven 2000).

Description of the intervention

The Cochrane Complementary Medicine Field defines complementary and alternative medicine and therapies (CM) as 'practices and ideas which are outside the domain of conventional medicine in several countries', which are defined by its users as 'preventing or treating illness, or promoting health and well-being' (Cochrane 2006). This definition is deliberately broad as therapies considered complementary practices in one country or culture may be conventional in another. Many therapies and practices are included within the scope of the Complementary Medicine Field.

CM has become popular with consumers worldwide. Women are the highest users of CM (Steel 2014). Many women would like to avoid pharmacological or invasive methods of pain relief in labour and this may contribute towards the popularity of complementary methods of pain management (Bennett 1999). A review of 14 trials with large sample sizes (more than 200 participants) on the use of CM in pregnancy identified a prevalence rate ranging from 1% to 87% (with nine trials falling between 20% and 60%) (Adams 2009). The review identified use of various complementary therapies including acupuncture and acupressure, aromatherapy, massage, yoga, homeopathy, and chiropractic care. The review also showed many pregnant women had used more than one complementary product or service (Adams 2009). According to an Australian survey (Steel 2012) almost half of pregnant women surveyed (49.4%) reported using at least one CM during pregnancy. The majority of women were seeking treatment for pain conditions during pregnancy, with many perceiving CM to be safer than conventional medicine, and equally effective. Some used CM as an adjunct therapy for conditions such as gestational diabetes (Steel 2012). In a review (Hall 2012) the most common indications for any CM referral were for labour induction and augmentation, nausea and vomiting, relaxation, back pain, anaemia, malpresentation, and other postnatal issues.

The most commonly cited CM practices associated with providing pain management in labour can be categorised into mind-body interventions (e.g. yoga, hypnosis, relaxation therapies), traditional medical practice (e.g. homoeopathy, traditional Chinese medicine), manual methods (e.g. massage, reflexology), pharmacologic and biological treatments, bio-electromagnetic applications (e.g. magnets) and herbal medicines. Manual methods used to manage pain in labour include massage and reflexology.

Massage involves manipulation of the body's soft tissues. It is commonly used to help relax tense muscles and to soothe

and calm the individual. Massage may help to relieve pain by assisting with relaxation, inhibiting sensory transmission in the pain pathways or by improving blood flow and oxygenation of tissues (McNabb 2006). Massage therapy can include specific physical techniques or manual therapy, such as deep tissue work, Swedish massage, neuromuscular massage or shiatsu (Rich 2002). Different massage techniques may suit different women. A woman who is experiencing backache during labour may find massage over the lumbosacral area soothing. Some women find light abdominal massage, known as effleurage, comforting or stress-relieving. Light stroking and soft touch have been associated with the release of oxytocin in response to low-intensity stimulation of the skin (Uvnäs-Moberg 2014). The pressure from massage may preempt the processing of painful stimuli because pressure fibres are longer and more myelinated, and relay signals to the brain more quickly than pain fibres (Melzack 1965). The potential positive effects from massage may decrease pain intensity, relieve muscle spasm, distract from pain, provide a sense of relaxation and reduce anxiety (McCaffery 1989). Additionally, hormonal activation of oxytocin or regulation of cortisol may contribute to the effect (Uvnäs-Moberg 2014). Research by Field demonstrates that massage therapy using moderate pressure is associated with a decrease in cortisol and an increase in serotonin and dopamine (Field 2005). The hormonal regulatory effects of massage have been shown to last several days and are dose dependent (Rapaport 2012). Massage therapists generally hold certification or licensure to practice massage in those countries or jurisdictions where such qualifications are recognised. Professional training programs for massage therapists also vary from country to country and may be undertaken as part of a broader health professional training or as a profession in its own right (Rich 2002).

Reflexologists propose that there are reflex points on the feet corresponding to organs and structures of the body, and that pain may be reduced by gentle manipulation or pressing certain parts of the foot. Reflexology differs from massage in that contact is more superficial and pressure is deeper on the specific points (Wang 2008). Pressure applied to the feet has been shown to result in an anaesthetising effect on other parts of the body (Ernst 1997). Reflexology involves the application of the thumb and forefinger to apply deep pressure to specific areas of the feet that are claimed to correspond to internal organs, glands and other parts of the body (Botting 1997). It has been claimed that by applying pressure to 'reflex zones', energy blocks or disturbances such as calcium, lactate or uric acid crystals are reabsorbed and later eliminated. This process is more commonly known as detoxification (Botting 1997; Wang 2008). It has also been proposed that reflexology may reduce stress, tension and maintain balance or homeostasis.

The application of pressure also includes thermal methods and heat packs. The warm packs are generally applied to the perineum in second stage and the thermal packs may be applied to various points on the body for pain relief during labour and birth. This review includes the use of thermal packs applied with pressure, but excludes the use of warm perineal compresses, a Cochrane review on this topic has been conducted (Aasheim 2017).

Other manual therapies include a variety of musculo-skeletal massage and manipulation therapies. They are often divided into myofascial ('soft tissue') and manipulative ('joint-based') with outcomes focusing on measures of pain, function and autonomic activation. Research has suggested that it is the therapeutic stimulation of the fascia throughout the body that provides benefit and these may be similar across the different modalities of therapy (Simmonds 2012). Some of the different modalities are described as follows.

Chiropractic care in pregnancy focuses on gentle myofascial relaxation around the pelvic muscles and joints and correction of spinal tilt and pressure, and adjustments, commonly known as Webster Technique, are also used to relieve pelvic constraint (Borggren 2007). Chiropractic care is commonly used for lower back and pelvic pain in pregnancy, and is the third most commonly sought treatment modality for during pregnancy, according to a 2005 survey conducted in the USA (Wang 2005). In a review of the literature on chiropractic care in pregnancy (Borggren 2007), the authors state that chiropractic care is commonly used for treating common musculo-skeletal symptoms during pregnancy and facilitation of uncomplicated labours.

Osteopathy focuses on functional movement of the body as a whole to stimulate the body's regulatory mechanisms and has a long tradition of use during pregnancy (King 2003). Osteopathic manipulative treatment (OMT) aims to restore the body's balance and release pain, with techniques typically including stretching and massage for general treatment of the soft tissues and mobilisation of specific joints and soft tissue using adjustment (Posadzki 2011).

Neuro-muscular therapy is a form of massage therapy used in the management of conditions where muscle tension and fatigue are prominent (Craig 2006).

Shiatsu, which means literally means 'finger pressure', has its origins in Japan and is similar to acupressure in its use of finger pressure to affect the balance of energy through acupoints (Long 2009). Shiatsu incorporates manipulation and stretches, along Traditional Chinese Medicine meridians (Robinson 2011).

Tuina, which translates literally to 'pinch and pull', is a form of therapeutic massage and bodywork in Traditional Chinese Medicine (TCM). Tuina is used for treatment of specific patterns of disharmony according to the same principles of TCM and varies widely in practice. Tuina manipulations involve sufficiently strong mechanical stimulation to muscle and tissue activating sensory and spinal nerves to stimulate physiological and biomechanical changes for a healing response (Fang 2013).

Trigger point, or myofascial trigger point therapy, is a form of remedial massage where direct and sustained pressure is applied to specific points on tender muscle tissue to reduce tension and pain. The trigger points are hard nodular structures within the muscle or fascia, located within a taut band of muscle fibres, and have histologically distinct markers (Janssens 1992). Muscles with trigger points are weaker than normal muscles, and are unable to move through the normal range of motion. They consequently recruit surrounding muscles, which can cause pain and further weakness in other areas. Muscles with active trigger points can occur due to overuse, inflammation, trauma, electrolyte imbalances, infections and nerve pain. They are commonly found around the neck and shoulders and arms (Dommerholt 2012).

Myotherapy is a form of manual therapy focusing on myofascial pain and dysfunction, from the muscles and surrounding connective tissue. The therapy focuses on musculoskeletal pain

and rehabilitation, using trigger point therapy, massage and manipulation of muscles (Nagata 1997).

Zero balancing is form of touch and energetic therapy, including electromagnetic fields (Greggus 2004), that aims to balance the relationship of the energy and structure of the bones and the deep tissues of the body (Denner 2009).

The intent is for these interventions to be included as separate reviews in the future.

How the intervention might work

Massage and reflexology are two techniques that may reduce pain by interrupting the transmission of pain signals, modifying pain perception, stimulating the release of endorphins or neurochemicals, or emotional regulation (Buckley 2015; Field 2007; Field 2010; Wang 2008). Recently, trials of massage have been linked to mediation of pain and pain perception through the activation of sensory nerves, and release of oxytocin (Uvnäs-Moberg 2014). Research proposes that the underlying mechanism of action is through increased vagal activity, where baroreceptors under the skin are innervated by the afferent fibres of the vagus nerve, leading to regulation of the autonomic nervous system (Field 2010). Magnetic Resonance Imaging (MRI) shows increases blood flow to the amygdala and hypothalamus, which are involved in regulation of the autonomic nervous system, as well as cortisol reduction and emotional regulation (Field 2010). For massage involving strong pressure, the gate theory proposed by Melzac suggests that pain signals are blocked by strong pressure on muscles, and that the signals along myelinated fibres travel to the brain more quickly (Melzack 1965).

Reflexology proposes an effect in promoting homeostasis, relaxation and detoxification by stimulating reflex zones on the foot that correspond with internal organs and glands of the body (Wang 2008).

Literature supports the benefits of warm/thermal packs through dilation of blood vessels, increased blood supply, affecting transmission of pain by reducing nociceptive stimulation and increasing collagen extensibility (Hayes 2000; Porth 1990).

Why it is important to do this review

There is interest from women to use additional forms of care to assist with pain management in labour. It is important to examine the effect, safety and acceptability of currently under-evaluated forms of treatment to enable women, health providers and policy makers to make informed decisions about care. This is an update of a review first published in 2012 (Smith 2012).

OBJECTIVES

To assess the effect, safety and acceptability of massage, reflexology and other manual methods to manage pain in labour.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs), quasi-RCTs and cluster RCTs. We included trials only presented as abstracts if additional information was obtained from the author on the methods and results.

Types of participants

Women in labour. (This includes women in high-risk groups, e.g. preterm labour or following induction of labour. We planned to use subgroup analysis for any possible differences in the effect of interventions in these groups.)

Types of interventions

The previous version of this review (Smith 2012) contributed to an overview of systematic reviews of interventions for pain management in labour (Jones 2012), and shared a generic protocol (Jones 2011). To avoid duplication, the different methods of pain management were listed in a specific order, from one to 15. Individual reviews focusing on particular interventions included comparisons with only the intervention above it on the list. The list is as follows.

1. Placebo/no treatment.
2. Hypnosis (Madden 2016).
3. Biofeedback (Barragán 2011).
4. Intracutaneous or subcutaneous sterile water injection (Derry 2011).
5. Immersion in water (Cluett 2009).
6. Aromatherapy (Smith 2011b).
7. Relaxation techniques (yoga, music, audio) (Smith 2011c).
8. Acupuncture or acupressure (Smith 2011a).
9. Manual methods (massage, reflexology) (this review).
10. Transcutaneous electrical nerve stimulation (Dowswell 2009).
11. Inhaled analgesia (Klomp 2011).
12. Opioids (Ullman 2010).
13. Non-opioid drugs (Othman 2011).
14. Local anaesthetic nerve blocks (Novikova 2011).
15. Epidural (including combined spinal epidural) (Anim-Somuah 2005; Simmons 2007).

In this review we included the following manual methods: massage, warm packs, thermal manual methods, reflexology, chiropractic, osteopathy, musculo-skeletal manipulation, deep tissue massage, neuro-muscular therapy, shiatsu, tuina, trigger point therapy, myotherapy and zero balancing. We included comparisons of any type of manual healing method with any other type of manual healing method, as well as any type of manual healing method compared with: 1) placebo/no treatment; 2) hypnosis; 3) biofeedback; 4) intracutaneous or subcutaneous sterile water injection; 5) immersion in water; 6) aromatherapy; 7) relaxation techniques (yoga, music, audio); or 8) acupuncture or acupressure.

Types of outcome measures

This review is one in a series of Cochrane reviews examining pain management in labour. The following list of primary outcomes are the ones which are common to all the reviews, as specified in the generic protocol (Jones 2011).

Primary outcomes

Effects of interventions

- Pain intensity (as defined by trialists).

- Satisfaction with pain relief (as defined by trialists).
- Sense of control in labour (as defined by trialists).
- Satisfaction with childbirth experience (as defined by trialists).

Safety of interventions

- Effect (negative) on mother/baby interaction.
- Breastfeeding (at specified time points).
- Assisted vaginal birth.
- Caesarean section.
- Side effects (for mother and baby; review specific).
- Admission to special care baby unit/neonatal intensive care unit (as defined by trialists).
- Apgar score less than seven at five minutes.
- Poor infant outcomes at long-term follow-up (as defined by trialists).

Other outcomes

- Cost (as defined by trialists).

Secondary outcomes

Maternal

Use of pharmacological pain relief in labour; length of labour; need for augmentation with oxytocin; perineal trauma (defined as episiotomy and incidence of second or third degree tear); and maternal blood loss (postpartum haemorrhage defined as greater than 500 mL), women's emotional experience of the intervention.

Neonatal

Need for mechanical ventilation; neonatal encephalopathy.

Search methods for identification of studies

The following methods section of this review is based on a standard template used by Cochrane Pregnancy and Childbirth.

Electronic searches

We searched Cochrane Pregnancy and Childbirth's Trials Register by contacting their Information Specialist (30 June 2017).

The Register is a database containing over 24,000 reports of controlled trials in the field of pregnancy and childbirth. For full search methods used to populate Pregnancy and Childbirth's Trials Register including the detailed search strategies for CENTRAL, MEDLINE, Embase and CINAHL; the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service, please follow this link to the editorial information about the Cochrane Pregnancy and Childbirth in the Cochrane Library and select the 'Specialized Register' section from the options on the left side of the screen.

Briefly, Cochrane Pregnancy and Childbirth's Trials Register is maintained by their Information Specialist and contains trials identified from:

1. monthly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. weekly searches of MEDLINE (Ovid);
3. weekly searches of Embase (Ovid);
4. monthly searches of CINAHL (EBSCO);
5. handsearches of 30 journals and the proceedings of major conferences;
6. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

Search results are screened by two people and the full text of all relevant trial reports identified through the searching activities described above is reviewed. Based on the intervention described, each trial report is assigned a number that corresponds to a specific Pregnancy and Childbirth review topic (or topics), and is then added to the Register. The Information Specialist searches the Register for each review using this topic number rather than keywords. This results in a more specific search set that has been fully accounted for in the relevant review sections (Included studies; Excluded studies; Studies awaiting classification; Ongoing studies).

In addition, we searched the Cochrane Central Register of Controlled Trials (CENTRAL; 2017, Issue 6) in the Cochrane Library (searched 30 June 2017), MEDLINE (1966 to 30 June 2017, CINAHL (1980 to 30 June 2017). See Appendix 1, Appendix 2, and Appendix 3 for search strategies used.

We also searched the following clinical trial registries for ongoing trials: the Australian New Zealand Clinical Trials Registry (4 August 2017), Chinese Clinical Trials Registry (4 August 2017), ClinicalTrials.gov, (4 August 2017), the National Center for Complementary and Integrative Health (4 August 2017), and the WHO International Clinical Trials Registry Platform (ICTRP) (4 August 2017). See Appendix 4 for search terms used.

Searching other resources

We searched the reference lists of retrieved trials. We did not apply any language or date restrictions.

Data collection and analysis

For methods used in the previous version of this review, see Smith 2012.

For this update, the following methods were used for assessing the 47 reports that were identified as a result of the updated search.

The following methods section of this review is based on a standard template used by Cochrane Pregnancy and Childbirth.

Selection of studies

Two review authors independently assessed for inclusion all the potential trials identified as a result of the search strategy. We resolved any disagreement through discussion or, if required, we consulted the third review author.

Data extraction and management

We designed a form to extract data. For eligible trials, two review authors extracted the data using the agreed form. We resolved discrepancies through discussion or, if required, we consulted the third review author. Data were entered into Review Manager software (RevMan 2014) and checked for accuracy.

When information regarding any of the above was unclear, we planned to contact authors of the original reports to provide further details.

Assessment of risk of bias in included studies

Two review authors independently assessed risk of bias for each trial using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). Any disagreement was resolved by discussion or by involving a third assessor.

(1) Random sequence generation (checking for possible selection bias)

We described for each included trial the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.

We assessed the method as:

- low risk of bias (any truly random process, e.g. random number table; computer random number generator);
- high risk of bias (any non-random process, e.g. odd or even date of birth; hospital or clinic record number);
- unclear risk of bias.

(2) Allocation concealment (checking for possible selection bias)

We described for each included trial the method used to conceal allocation to interventions prior to assignment and assessed whether intervention allocation could have been foreseen in advance of, or during recruitment, or changed after assignment.

We assessed the methods as:

- low risk of bias (e.g. telephone or central randomisation; consecutively numbered sealed opaque envelopes);
- high risk of bias (open random allocation; unsealed or non-opaque envelopes, alternation; date of birth);
- unclear risk of bias.

(3.1) Blinding of participants and personnel (checking for possible performance bias)

We described for each included trial the methods used, if any, to blind trial participants and personnel from knowledge of which intervention a participant received. We considered that trials were at low risk of bias if they were blinded, or if we judged that the lack of blinding unlikely to affect results. We assessed blinding separately for different outcomes or classes of outcomes.

We assessed the methods as:

- low, high or unclear risk of bias for participants;
- low, high or unclear risk of bias for personnel.

(3.2) Blinding of outcome assessment (checking for possible detection bias)

We described for each included trial the methods used, if any, to blind outcome assessors from knowledge of which intervention a participant received. We assessed blinding separately for different outcomes or classes of outcomes.

We assessed methods used to blind outcome assessment as:

- low, high or unclear risk of bias.

(4) Incomplete outcome data (checking for possible attrition bias due to the amount, nature and handling of incomplete outcome data)

We described for each included trial, and for each outcome or class of outcomes, the completeness of data including attrition and exclusions from the analysis. We stated whether attrition and exclusions were reported and the numbers included in the analysis at each stage (compared with the total randomised participants), reasons for attrition or exclusion where reported, and whether missing data were balanced across groups or were related to outcomes. Where sufficient information was reported, or could be supplied by the trial authors, we planned to re-include missing data in the analyses which we undertook.

We assessed methods as:

- low risk of bias (e.g. no missing outcome data; missing outcome data balanced across groups);
- high risk of bias (e.g. numbers or reasons for missing data imbalanced across groups; 'as treated' analysis done with substantial departure of intervention received from that assigned at randomisation);
- unclear risk of bias.

(5) Selective reporting (checking for reporting bias)

We described for each included trial how we investigated the possibility of selective outcome reporting bias and what we found.

We assessed the methods as:

- low risk of bias (where it is clear that all of the trial's pre-specified outcomes and all expected outcomes of interest to the review have been reported);
- high risk of bias (where not all the trial's pre-specified outcomes have been reported; one or more reported primary outcomes were not pre-specified; outcomes of interest are reported incompletely and so cannot be used; trial fails to include results of a key outcome that would have been expected to have been reported);
- unclear risk of bias.

(6) Other bias (checking for bias due to problems not covered by (1) to (5) above)

We described for each included trial any important concerns we had about other possible sources of bias.

(7) Overall risk of bias

We made explicit judgements about whether trials were at high risk of bias, according to the criteria given in the *Handbook* (Higgins 2011). With reference to (1) to (6) above, we planned to assess the likely magnitude and direction of the bias and whether we considered it is likely to impact on the findings. In future updates, we will explore the impact of the level of bias through undertaking sensitivity analyses; see Sensitivity analysis.

Assessment of the quality of the evidence using the GRADE approach

For this update the quality of the evidence was assessed using the GRADE approach as outlined in the GRADE handbook in order to

assess the quality of the body of evidence relating to the following outcomes, where data were available.

- Pain intensity (as defined by trialists).
- Sense of control in labour.
- Satisfaction with childbirth experience.
- Assisted vaginal birth.
- Caesarean section.
- Use of pharmacological pain relief in labour.
- Length of labour.

We used the GRADEpro Guideline Development Tool to import data from Review Manager 5 (RevMan 2014) in order to create 'Summary of findings' tables. A summary of the intervention effect and a measure of quality for each of the above outcomes was produced using the GRADE approach. The GRADE approach uses five considerations (trial limitations, consistency of effect, imprecision, indirectness and publication bias) to assess the quality of the body of evidence for each outcome. The evidence can be downgraded from 'high quality' by one level for serious (or by two levels for very serious) limitations, depending on assessments for risk of bias, indirectness of evidence, serious inconsistency, imprecision of effect estimates or potential publication bias.

Measures of treatment effect

Dichotomous data

For dichotomous data, we presented results as summary risk ratios (RRs) with 95% confidence intervals (CIs).

Continuous data

We used the mean difference (MD) if outcomes were measured in the same way between trials. We used the standardised mean difference (SMD) to combine trials that measured the same outcome, but used different methods.

Unit of analysis issues

We included three trials with multiple arms (Ganji 2013a; Kimber 2008; Mortazavi 2012); these are described in the Characteristics of included studies tables. In Ganji 2013a there were four groups, three of which were intervention groups: (cold pack versus intermittent hot and cold packs versus heat packs only versus a control of routine care). We included the heat pack versus usual care arms in comparison 2 of our review, and we disregarded the other two of the arms of the trial, in accordance with methods in the *Cochrane Handbook* (section 16.5.4). In comparison 3 of our review, we included three arms of the trial and disregarded the heat pack arm, so there were comparisons of: 1) cold packs versus usual care; and 2) intermittent hot and cold packs versus usual care; we split the 'usual care' group between the two comparisons, a method described in the *Cochrane Handbook* (section 16.5.4) (Higgins 2011). Both Kimber 2008 and Mortazavi 2012 each included three arms. In Kimber 2008 there were three arms: massage and relaxation versus placebo and relaxation techniques and music verus usual care. We disregarded the placebo group from the Kimber 2008 trial, because this is included in a separate Cochrane review on relaxation techniques, and only included the massage and relaxation versus usual care group arms (comparison 1 of our review). In Mortazavi 2012 there were three arms: massage versus control group 1 with attendant versus control group 2. However, the data were only reported narratively and so there were no data included in meta-analysis.

Cluster-randomised trials

If we identified cluster-randomised trials we planned to include them in the analyses along with individually randomised trials. If such trials are identified in future updates we will adjust their sample sizes using the methods described in the *Cochrane Handbook* using an estimate of the intracluster correlation coefficient (ICC) derived from the trial (if possible), from a similar trial or from a trial of a similar population. If we use ICCs from other sources, we will report this and conduct sensitivity analyses to investigate the effect of variation in the ICC. If we identify both cluster randomised trials and individually-randomised trials, we plan to synthesise the relevant information. We will consider it reasonable to combine the results from both if there is little heterogeneity between the trial designs and the interaction between the effect of intervention and the choice of randomisation unit is considered to be unlikely.

We will also acknowledge heterogeneity in the randomisation unit and perform a*subgroup* analysis to investigate the effects of the randomisation unit.

Cross-over trials

We have excluded cross-over trials because they not a suitable design for trials looking at interventions in labour.

Dealing with missing data

We noted levels of attrition for included trials. If more eligible trials are included in future updates of this review, we will use sensitivity analysis to explore the impact of including trials with high levels of missing data in the overall assessment of treatment effect.

For all outcomes, analyses were carried out, as far as possible, on an intention-to-treat basis, i.e. we attempted to include all participants randomised to each group in the analyses. The denominator for each outcome in each trial was the number randomised minus any participants whose outcomes were known to be missing.

Assessment of heterogeneity

We assessed statistical heterogeneity in each meta-analysis using the Tau^2, I^2 and Chi^2 statistics. We regarded heterogeneity as substantial if I^2 was greater than 30% and either Tau^2 was greater than zero, or there was a low P value (less than 0.10) in the Chi^2 test for heterogeneity. If we identified substantial heterogeneity (above 30%), we planned to explore it using prespecified subgroup analysis.

Assessment of reporting biases

In future updates, we will investigate reporting biases (such as publication bias) using funnel plots if there are 10 or more trials in the meta-analysis. We will assess funnel plot asymmetry visually. If asymmetry is suggested by a visual assessment, we will perform exploratory analyses to investigate it.

Data synthesis

We carried out statistical analysis using the Review Manager software (RevMan 2014). We used fixed-effect meta-analysis for

combining data where it was reasonable to assume that trials were estimating the same underlying treatment effect, i.e. where trials were examining the same intervention, and the trials' populations and methods were judged sufficiently similar.

If there was clinical heterogeneity sufficient to expect that the underlying treatment effects differed between trials, or if substantial statistical heterogeneity was detected, we used random-effects meta-analysis to produce an overall summary if an average treatment effect across trials was considered clinically meaningful. The random-effects summary will be treated as the average range of possible treatment effects and we will discuss the clinical implications of treatment effects differing between trials. If the average treatment effect is not clinically meaningful, we will not combine trials. If we used random-effects analyses, the results were presented as the average treatment effect with 95% CIs, and the estimates of Tau^2 and I^2.

Subgroup analysis and investigation of heterogeneity

We planned to investigate substantial heterogeneity using subgroup analyses. We considered heterogeneity as substantial if Tau^2 was greater than zero and either I^2 was greater than 30% or there was a low P value (less than 0.10) in the Chi^2 test for heterogeneity. We considered whether an overall summary was meaningful, and if it was, used a random-effects analysis.

We planned to carry out the following subgroup analyses.

1. Spontaneous labour versus induced labour.
2. Primiparous versus multiparous.
3. Term versus preterm birth.
4. Continuous support in labour versus no continuous support.

We planned to visually examine the forest plots of subgroup analyses to look at whether there was overlap between 95% CIs for the effects of different groups; with non-overlapping CIs suggesting a difference between subgroups. We planned to report the results of subgroup analyses quoting the Chi^2 statistic and P value, and the interaction test I^2 value. There were insufficient trials in this update to allow for these additional analyses.

Sensitivity analysis

We planned to conduct sensitivity analyses to explore the effect of risk of bias for each comparison by restricting analysis to those trials rated as 'low risk of bias' for random sequence generation and allocation concealment. In this version of the review there were too few trials in any one comparison (with design limitations) contributing data and so we did not carry out this additional analysis. Iif sufficient data become available to carry out sensitivity analysis in future updates, we will limit analyses to the primary outcomes. We carried out sensitivity analyses to explore the impact of including quasi-RCTs in the analyses. We excluded quasi-RCTs from the analyses to see if this made any difference to the overall result.

RESULTS

Description of studies

Results of the search

The search retrieved 47 potentially eligible trial reports (see Figure 1). We also reassessed the four trials listed as awaiting further classification and ongoing in the previous version of the review (Smith 2012). This updated review includes massage trials only. We found no trials of reflexology which were eligible for inclusion. We included eight new trials (Behmanesh 2009; Bolbol-Haghighi 2016; Ganji 2013a; Janssen 2008; Levett 2016; Mortazavi 2012; Silva 2013; Taavoni 2013;) and excluded 10 trials.

Figure 1. Trial flow diagram.

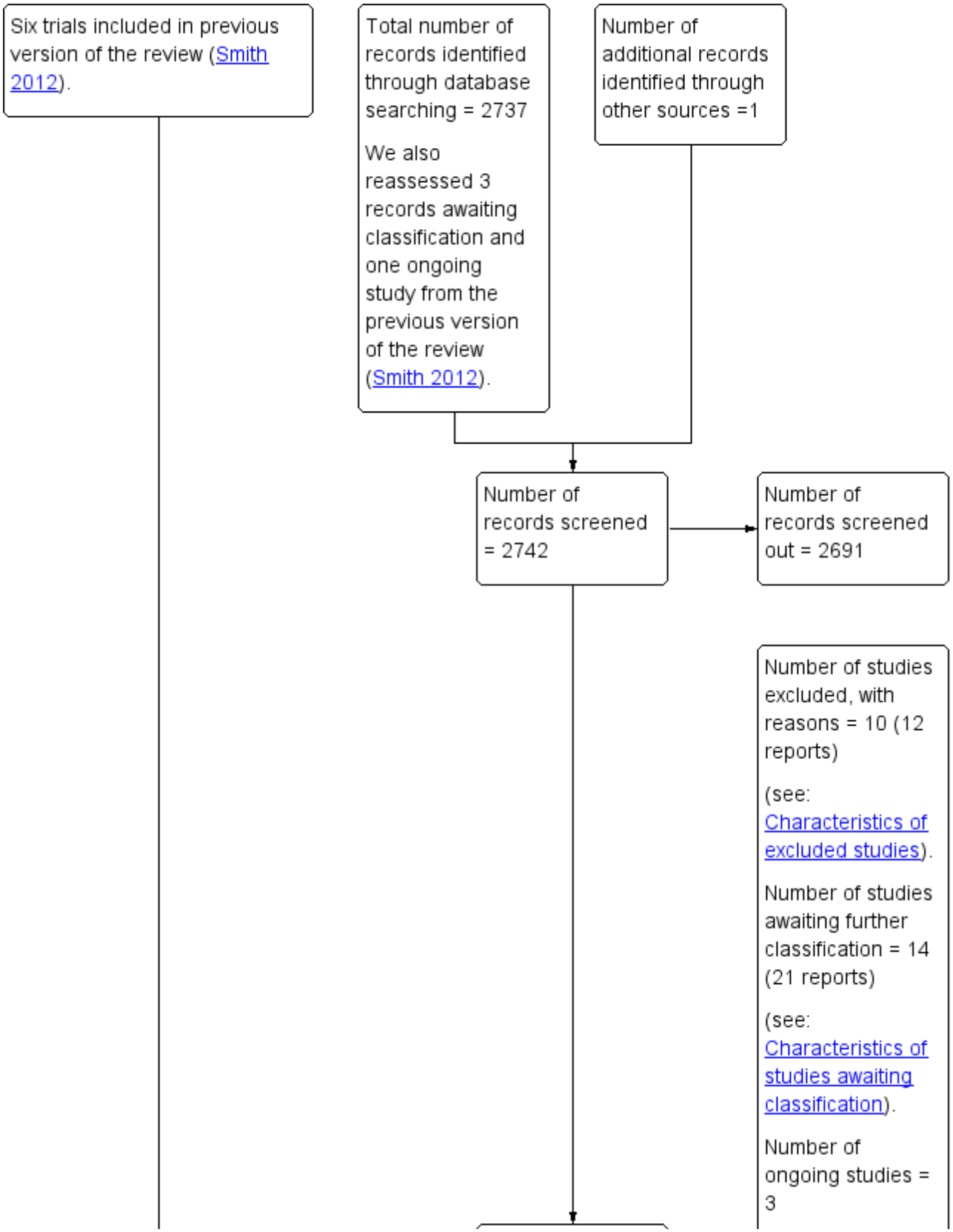
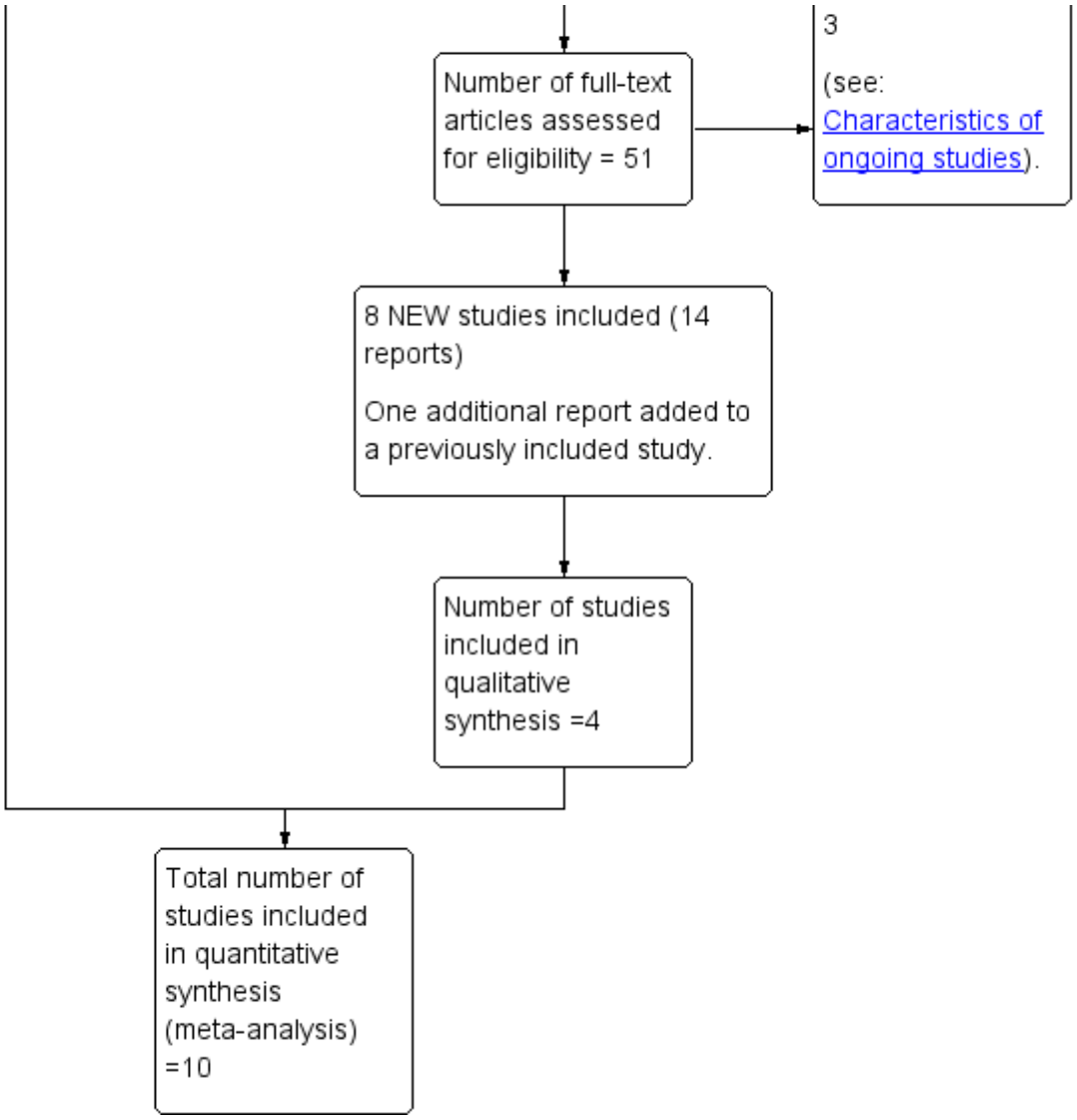


Figure 1. (Continued)



In total, 14 trials are now included, 11 excluded, 14 are awaiting further classification and 3 are ongoing. See Characteristics of included studies, Characteristics of excluded studies, Characteristics of studies awaiting classification and Characteristics of ongoing studies.

Our search found no trials on the following interventions; reflexology, chiropractic, osteopathy, musculo-skeletal manipulation, deep tissue massage, neuro-muscular therapy, shiatsu, tuina, trigger point therapy, myotherapy and zero balancing.

Included studies

This review now includes 14 trials, involving 1172 women. Four of these trials, involving 274 women (Abasi 2009; Behmanesh 2009; Field 1997; Mortazavi 2012), did not contribute data to the review.

Trial design

All trials used parallel design. Eleven trials included two groups; two trials included three groups (Kimber 2008; Mortazavi 2012); and one trial included four groups (Ganji 2013a). All used active controls, including standard care (Abasi 2009; Behmanesh 2009; Bolbol-Haghighi 2016; Chang 2002; Janssen 2008; Karami 2007; Kimber 2008; Levett 2016; Mortazavi 2012; Silva 2013; Taavoni 2013), breathing exercises (Field 1997), presence of an attendant (Mortazavi 2012), a cold pack (Ganji 2013a) and music (Kimber 2008; Taghinejad 2010).

Sample size

The number of participants in the included trials ranged from 28 (Field 1997) to 176 (Levett 2016).

Trial location and sources of women

Eight trials were undertaken in Iran (Abasi 2009; Behmanesh 2009; Bolbol-Haghighi 2016; Ganji 2013a; Karami 2007; Mortazavi 2012; Taavoni 2013; Taghinejad 2010), and one trial each in Taiwan (Chang 2002), Canada (Janssen 2008), Australia (Levett 2016), Brazil (Silva 2013) United Kingdom (Kimber 2008) and the USA (Field 1997).

Participants

Ten trials recruited primiparous women only (Abasi 2009; Behmanesh 2009; Chang 2002; Ganji 2013a; Janssen 2008; Karami 2007; Levett 2016; Silva 2013; Taavoni 2013; Taghinejad 2010), one recruited multiparous women only (Mortazavi 2012), and the remaining trials did not specify parity (Bolbol-Haghighi 2016; Field 1997; Kimber 2008). Most trials only included women at term (Abasi 2009; Behmanesh 2009; Chang 2002; Janssen 2008; Karami 2007; Mortazavi 2012; Silva 2013; Taavoni 2013). Three trials (Kimber 2008; Field 1997; Levett 2016) recruited women prior to 37 weeks' gestation from an antenatal clinic. Two trials recruited women in labour but did not report gestational age (Bolbol-Haghighi 2016; Taghinejad 2010).

Types of intervention

In three trials massage was taught to the partner who applied massage during labour (Chang 2002; Field 1997; Kimber 2008). It was unclear who applied massage in the Karami 2007 and Taghinejad 2010 trials. Massage was administered by a masseuse in two studies (Abasi 2009; Janssen 2008), and by a physiotherapist in one study (Silva 2013). There was variation in the frequency, duration and technique in how the massage was applied. In three studies (Abasi 2009; Bolbol-Haghighi 2016; Chang 2002) massage was delivered 30 minutes during each phase of labour using a variety of massage techniques. Massage was applied during contractions for a total of 30 minutes (no technique specified) in Taghinejad 2010. One study (Kimber 2008) administered pre-birth training taught by an accredited massage therapist to partners. The partner delivered slow rhythmic long stroke massage, with the hands moving up and down with slow rhythmic breathing, and in Mortazavi 2012 firm rhythmic massage was used on the shoulders, back, abdomen and sacrum for 30 minutes in all three phases of labour. Effleurage was applied in Karami 2007 (no other details were reported). In the trial by Field 1997, trial partners were trained to deliver massage involving a 20-minute sequence of stroking movements around five regions including head, neck, shoulder, back and foot, from 3 cm to 5 cm dilation. In Levett 2016, an antenatal education package was delivered to women and their birth partners with a variety of therapies including massage, yoga, breathing, acupressure and relaxation/visualisation. One study (Behmanesh 2009) applied heat packs to the lower back during the first stage of labour and to the perineum during the second stage. Heat and ice packs were applied by a doula in Ganji 2013a.

Outcome measures

The following primary outcomes were reported in the trials: pain intensity (Abasi 2009; Behmanesh 2009; Chang 2002; Ganji 2013a; Janssen 2008; Kimber 2008; Silva 2013; Taavoni 2013; Taghinejad 2010); satisfaction with the childbirth experience (Chang 2002; Kimber 2008); sense of control in labour (Levett 2016; Kimber 2008); assisted vaginal birth (Ganji 2013a; Janssen 2008; Karami 2007; Kimber 2008; Levett 2016); caesarean section rate (Bolbol-Haghighi 2016; Janssen 2008; Karami 2007; Kimber 2008; Levett 2016; Silva 2013); admission to neonatal intensive care (Kimber 2008; Levett 2016).

The following secondary outcomes were reported in the following trials: use of pharmacological pain relief (Chang 2002; Janssen 2008; Kimber 2008; Levett 2016; Taghinejad 2010); augmentation (Bolbol-Haghighi 2016; Chang 2002; Ganji 2013a; Janssen 2008; Kimber 2008; Levett 2016); length of labour (Bolbol-Haghighi 2016; Chang 2002; Janssen 2008; Kimber 2008; Levett 2016; Silva 2013); emotional experience of labour (anxiety) (Chang 2002); spontaneous vaginal birth (Bolbol-Haghighi 2016; Janssen 2008, Kimber 2008; Levett 2016); Apgar score less than seven at five minutes (Levett 2016; Silva 2013); postpartum haemorrhage (Levett 2016): resuscitation of newborn (Kimber 2008; Levett 2016); and perineal trauma (Ganji 2013a; Levett 2016).

Date of the trials

Trials took place between 1999 and 2015. Two trials did not report on trial dates (Field 1997; Janssen 2008). The majority of trials reported a trial duration of two years.

Funding

Nine trials reported their funding sources. Bolbol-Haghighi 2016 reported funding from the Research Deputy of the Shahroud University of Medical Sciences. Field 1997 reported funding from the National Institute of Mental Health (NIMH) Research Scientist Award (#MH00331) and NIMH Research Grant (#MH46586) and a grant from Johnson & Johnson. Ganji 2013a reported funding from the Research Deputy of Mazandaran University of Medical Sciences (project number H89-26). Janssen 2008 reported funding from the Holistic Health Research Foundation of Canada, Massage Therapy Foundation, and Massage Therapists' Association of BC. Kimber 2008 received grant funding from Oxfordshire Health Services Research Committee (OHSRC). Levett 2016 received funding associated with an Australian Postgraduate Award, and a postgraduate stipend from the Western Sydney University. Mortazavi 2012 reported receiving funding associated with a student Scientific Research Center of Tehran University of Medical Sciences and Health Services grant. Silva 2013 reported receiving funding from CNPQ, who provided the master's degree scholarship and aided in the development of this trial. Taavoni 2013 was funded by the Researches Department of Tehran University of Medical Sciences.

Declarations of Interest

Six trials reported no declarations of interest (Bolbol-Haghighi 2016; Ganji 2013a; Janssen 2008; Levett 2016; Mortazavi 2012; Taghinejad 2010. The remaining trials did not report whether any conflicts of interest were present. We note that Janssen 2008 reported no conflict of interest despite being funded by the Massage Therapy Foundation and the Massage Therapists' Association.

Excluded studies

We excluded 11 trials (see Characteristics of excluded studies). We excluded two trials as it was not clear whether they were randomised controlled trials (Dehcheshmeh 2015; Hajiamini 2012). Eight trials did not meet the inclusion criteria for 'types of interventions' and examined interventions that are included in other pain management systematic reviews of acupressure (Akbarzadeh 2014; Bastani 2016; Mafetoni 2015; Ozgoli 2016; Torkzahrani 2017), aromatherapy (Fili 2017; Nourbakhsh 2012) and relaxation (Yildirim 2004) (included in Smith 2011c). We excluded one trial because it compared reflexology plus saline infusion versus routine care plus saline infusion plus oxytocin, which we assessed as not being a valid comparison for this review (Valiani 2010).

Risk of bias in included studies

See Figure 2 and Figure 3 for graphical summaries of our 'Risk of bias' bias assessments based on the seven 'Risk of bias' domains. We did not judge any trial to have a low risk of bias for all domains.

Figure 2. 'Risk of bias' graph: review authors' judgements about each 'Risk of bias' item presented as percentages across all included trials.

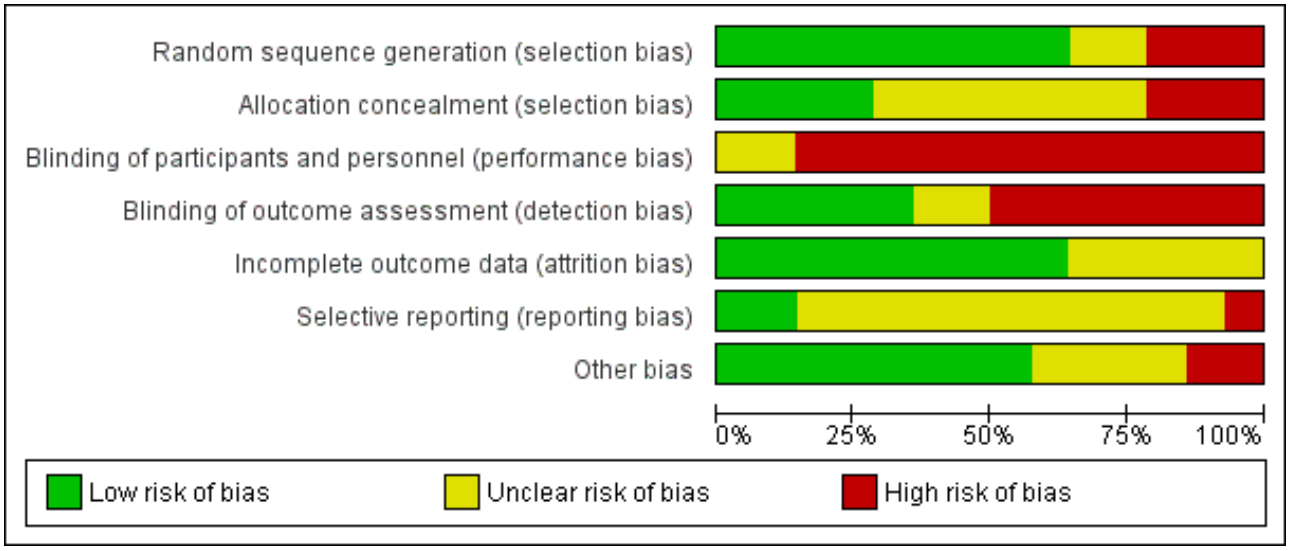


Figure 3. 'Risk of bias' summary: review authors' judgements about each 'Risk of bias' item for each included study.

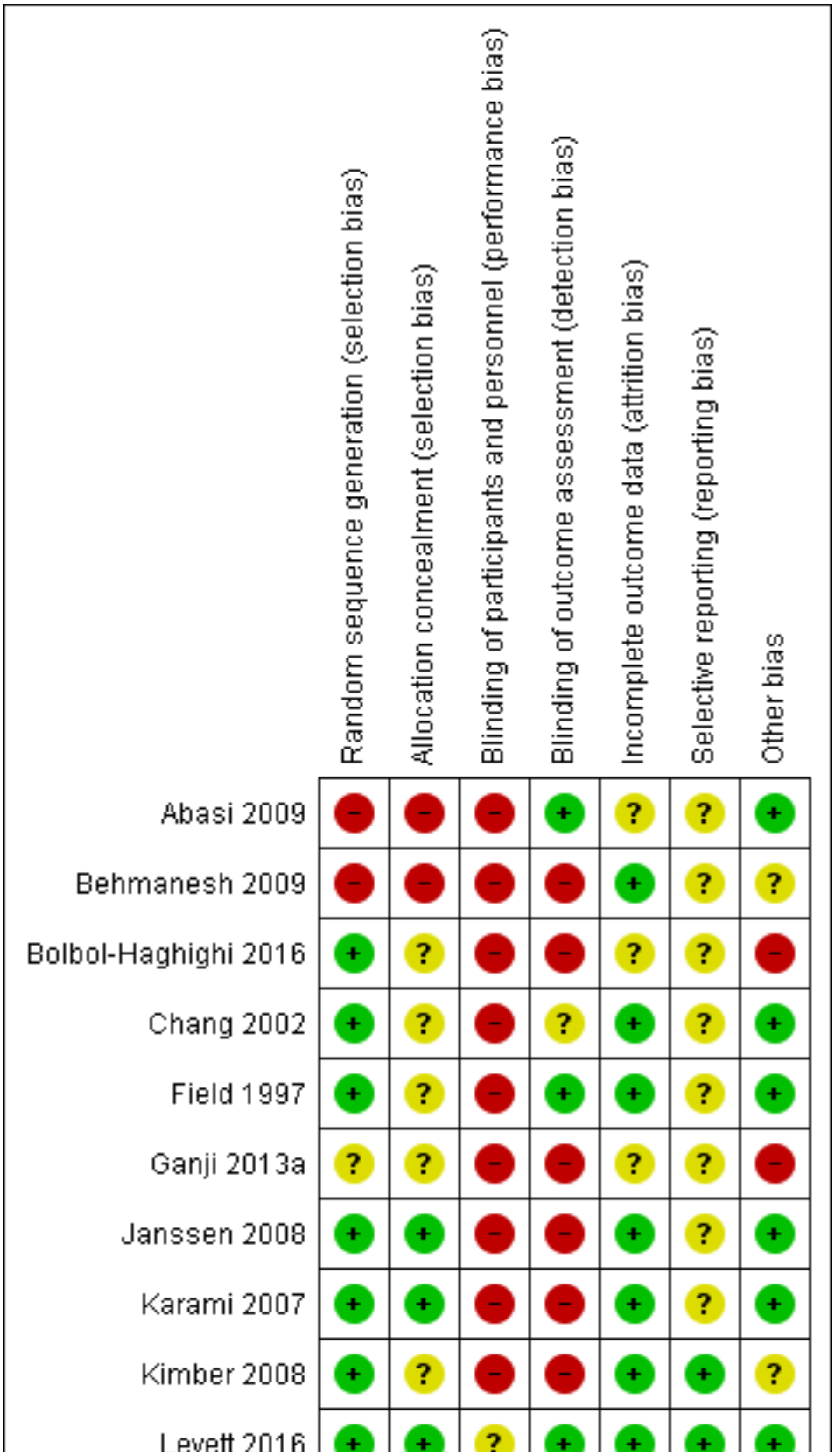
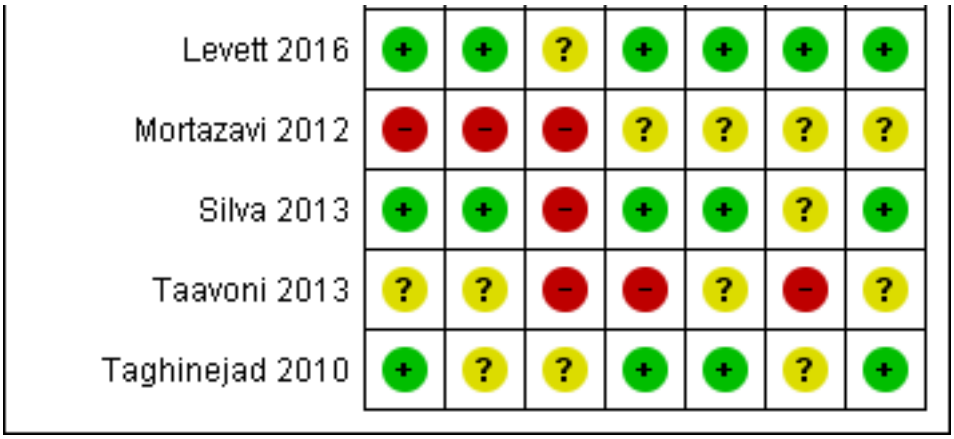


Figure 3. (Continued)



Allocation

Method of allocation

We rated nine trials as having low risk of bias for method of randomisation: three trials used a random number table (Bolbol-Haghighi 2016; Field 1997; Karami 2007); one trial used ball tossing (Chang 2002); and five trials used computer generation (Janssen 2008; Kimber 2008; Levett 2016; Silva 2013; Taghinejad 2010). We rated three trials as having high risk of bias because they used quasi-randomised methods for randomisation, such as date of admission, alternate allocation and day of the week (Abasi 2009; Behmanesh 2009; Mortazavi 2012). The risk of bias was unclear in two trials (Ganji 2013a; Taavoni 2013) due to unclear reporting.

Allocation concealment

We judged the method of allocation concealment to have low risk of bias in four trials: sealed envelopes were used in two trials (Janssen 2008; Karami 2007); and randomisation was concealed centrally in two trials (Levett 2016; Silva 2013). Three trials were at high risk of bias as they used methods for allocation that could have enabled investigators enrolling participants to possibly foresee assignments (Abasi 2009; Behmanesh 2009; Mortazavi 2012). We assessed seven trials as having unclear risk of bias for this domain, due to no or insufficient reporting (Bolbol-Haghighi 2016; Chang 2002; Field 1997; Ganji 2013a; Kimber 2008; Taavoni 2013; Taghinejad 2010).

Blinding

It is difficult to conceal some of these manual methods from participants and clinicians. We did not assess any trial as being at low risk of bias for this domain. We assessed 12 trials as having high risk of performance bias, due to there being no blinding of the women who completed subjective outcomes (Abasi 2009; Behmanesh 2009; Bolbol-Haghighi 2016; Chang 2002; Field 1997; Ganji 2013a; Janssen 2008; Karami 2007; Kimber 2008; Mortazavi 2012; Silva 2013; Taavoni 2013). We assessed two trials as having unclear risk of bias. We judged Levett 2016 to have unclear risk of bias because women were aware of their treatment allocation, but the control group were not aware of the course content. It was also reported that staff providing care at the birth were not aware of treatment group, and were not aware of course content, but may have provided support with techniques if known. We assessed Taghinejad 2010 as having unclear risk of bias due to participants not being blinded, and the blinding status of caregivers being unclear.

For detection bias, we judged five trials as having low risk of bias, because the outcome assessor was blind to group allocation (Abasi 2009; Field 1997; Levett 2016; Silva 2013; Taghinejad 2010). We assessed seven trials as having high risk of bias, because assessors were involved with the delivery of the intervention and undertook outcome assessment, or there was no blinding of the intervention (Behmanesh 2009; Bolbol-Haghighi 2016; Ganji 2013a; Janssen 2008; Karami 2007; Kimber 2008; Taavoni 2013). We assigned two trials as having unclear risk of bias for this domain due to insufficient reporting (Chang 2002; Mortazavi 2012).

Incomplete outcome data

We assessed attrition bias as 'low' risk in nine trials because there was either no loss to follow-up or loss was minimal with reasons for dropout well described and balanced across groups (Behmanesh 2009; Chang 2002; Field 1997; Janssen 2008; Karami 2007; Kimber 2008; Levett 2016; Silva 2013; Taghinejad 2010). We judged five trials to have an unclear risk of bias due to insufficient reporting (Abasi 2009; Bolbol-Haghighi 2016; Ganji 2013a; Mortazavi 2012; Taavoni 2013).

Selective reporting

We assessed the risk of bias from selective reporting as low in two trials (Kimber 2008; Levett 2016). In both these trials, protocol or student documents were available to the review team to confirm all outcomes were reported. We assessed one trial as having high risk of bias due to denominators not being available (Taavoni 2013). We could not verify reporting bias in 11 trials because there were no protocols available (Abasi 2009; Behmanesh 2009; Bolbol-Haghighi 2016; Chang 2002; Field 1997; Ganji 2013a; Janssen 2008; Karami 2007; Mortazavi 2012; Silva 2013; Taghinejad 2010).

Other potential sources of bias

We rated the risk of bias from other sources of bias as low in eight trials (Abasi 2009; Chang 2002; Field 1997; Janssen 2008; Karami 2007; Levett 2016; Silva 2013; Taghinejad 2010) due to baseline characteristics being balanced and no other issues being identified. We judged two trials as having high risk of bias due to unclear reporting. Three reports from one trial (Ganji 2013a)

specify different exclusion criteria and it is not clear if the results are reported for a subset of a larger trial. We assessed Bolbol-Haghighi 2016 as having high risk or bias due to there being some baseline imbalances between groups with regard to age and education. We assessed four trials as having unclear risk of bias due to insufficient information (Kimber 2008; Mortazavi 2012; Taavoni 2013). Behmanesh 2009 did not report baseline characteristics.

Effects of interventions

See: **Summary of findings for the main comparison** Massage compared to usual care for pain management in labour; **Summary of findings 2** Warm pack compared to usual care for pain management in labour; **Summary of findings 3** Thermal manual methods compared to usual care for pain management in labour; **Summary of findings 4** Massage compared to music for pain management in labour

Data from Field 1997 were not in a form that could be included in the meta-analysis.Three additional outcomes, spontaneous vaginal birth, resuscitation of the newborn, and first degree tear are included in this update of the review. These outcomes were not pre-specified and were retrospectively included as "other" relevant outcomes to the evaluation of the intervention.

1. Massage versus usual care

We included 10 trials with a total of 795 women in the meta-analysis. In one trial (Kimber 2008) there were three arms: massage and relaxation, versus placebo and relaxation techniques and music, versus usual care. We disregarded the placebo group from this trial, because this is included in a separate Cochrane review on relaxation techniques; we only included the massage and relaxation versus usual care group arms in this comparison. No trial reported on the following outcomes: satisfaction with pain relief; effect on mother/baby interaction; breastfeeding; poor infant outcomes at long-term follow up and costs. One trial (Mortazavi 2012), which also included three arms with two control groups, was only reported narratively and so it was not possible to include any data in the analyses.

Primary outcomes

1.1) Pain intensity

The trials reported on the intensity of pain during the three stages of labour (Analysis 1.1). Four trials assessed pain using the Visual Analogue Scale (VAS) (Abasi 2009; Karami 2007; Kimber 2008; Silva 2013); one used the self-reported pain intensity (PPI) scale (Chang 2002); and one used the McGill Present Pain intensity scale (Janssen 2008). Lower pain scores equated to less pain.

1.1.1) First stage of labour

There was a very small reduction in pain intensity for women receiving massage compared with usual care (standardised mean difference (SMD) −0.81, 95% confidence interval (CI) −1.06 to −0.56; six trials; 362 women; low-quality evidence).

1.1.2) Second stage of labour

There were no clear differences between groups in pain intensity (SMD −0.98, 95% CI −2.23 to 0.26; two trials; 124 women; there was substantial heterogeneity I^2 = 91%; Tau^2 = 0.73).

1.1.3) Third stage of labour

There were no clear differences between groups in reduced pain intensity (SMD −1.03, 95% CI −2.17 to 0.11; two trials; 122 women; I^2 = 89%; Tau^2 = 0.60).

Data from Field 1997 were not in a form that could be added to the forest plots. This study reported less labour pain on a Likert scale for the massage group compared with the control (mean 3.5 versus 5.0).

Mortazavi 2012 reported pain scores graphically and we were unable to extract these data. The authors reported a reduction in pain during all stages of labour in the intervention group.

We conducted a sensitivity analysis in which we excluded the quasi-RCT (Abasi 2009) from the analysis (data not shown). This made little difference to the overall treatment effect, although statistical heterogeneity as indicated by I^2 completely disappeared for the results in the second and third stages of labour.

1.2) Sense of control in labour

Two trials reported outcome but assessed it with different versions of the Labour Agentry Scale. There was an increase in the sense of control during labour (mean difference (MD) 14.05, 95% CI 3.77 to 24.33, one trial, 124 women, low-quality evidence) using the extended Labour Agentry scale (Levett 2016) (Analysis 1.2).

1.3) Sense of control in labour (shortened Labour Agency Scale)

One small trial (Kimber 2008) used a shortened version of the Labour Agentry Scale, where a lower score is positive and means the woman felt more in control. This trial found an increase in the sense of control in labour in the massage group as indicated by a lower score (MD −6.10, 95% CI −11.68 to −0.52 one trial, 40 women, low-quality evidence) (Analysis 1.3).

1.4) Satisfaction with childbirth experience (continuous data)

Two trials reported this outcome but measured it in different ways and the data could not be combined. In Chang 2002, there was no clear difference in satisfaction with childbirth experience between groups (MD 0.47, 95% CI −0.13 to 1.07, one trial, 60 women, low-quality evidence) using an unspecified scale (Analysis 1.4).

1.5) Satisfaction with childbirth experience (dichotomous data)

This question was assessed asking whether labour/birth was: hard work but wonderful; ok in the end; awful; or other, in Kimber 2008. We analysed data on the response "hard work but wonderful". There was a slight increase in satisfaction with childbirth for the massage group compared with the control (risk ratio (RR) 1.90, 95% CI 1.07 to 3.38, one trial, 60 women, very low-quality evidence) (Analysis 1.5).

1.6) Assisted vaginal birth

There were no clear differences between groups in assisted vaginal birth (average RR 0.71, 95% CI 0.44 to 1.13, four trials, 368 women, very low-quality evidence) (Analysis 1.6).

1.7) Caesarean section

There were no clear differences between groups in caesarean section rates (RR 0.75, 95% CI 0.51 to 1.09, six trials, 514 women, very low-quality evidence) (Analysis 1.7).

1.8) Admission to neonatal intensive care unit

There were no clear differences between groups in rates of admission to neonatal intensive care (RR 0.71, 95% CI 0.31 to 1.62, two trials, 231 women) (Analysis 1.8).

1.9) Apgar score less than seven at five minutes

There were no clear differences between groups (RR 0.72, 95% CI 0.17 to 3.14, two trials, 215 women) (Analysis 1.9).

Secondary outcomes

1.10) Use of pharmacological pain relief

There were no clear differences in use of pharmacological pain relief between groups (average RR 0.81, 95% CI 0.37 to 1.74, four trials, 368 women, very low-quality evidence). There was substantial heterogeneity and we applied a random-effects model (I^2 = 91%; Tau^2 = 0. 45) (Analysis 1.10). Heterogeneity was explained by the Levett 2016 trial. Omitting this trial from the meta-analysis reduced heterogeneity to I^2 = 43%. This trial did not involve delivery of the intervention during labour. The intervention was delivered during the antenatal period with time prior to labour to practice the interventions learnt during this period with the aim of managing pain in labour.

1.11) Length of labour

There was no clear difference between groups with the length of labour reported in minutes (MD 20.64, 95% −58.24 to 99.52, six trials, 514 women, very low-quality evidence). There was significant heterogeneity (I^2 = 72%, Tau^2 = 6384.7) and we applied a random-effects model (Analysis 1.11). This heterogeneity is likely explained by the varied length of measurement during differing phases of labour.

In addition, Karami 2007 found reduced length of labour in the first stage of labour for women receiving massage compared with usual care (MD −116.34, 95% −172.68 to −60.00). The Mortazavi 2012 trial reported a duration of labour in the massage group among primiparous women during the active stage of 2.6 hours (standard deviation (SD) 0.95 versus 7.5 hours (SD 1.87) in controls (60% of the women in the massage group delivered in less than 3.5 hours). We did not include this in the meta-analysis because only duration of "active phase", described as 5 cm to 7 cm dilatation, was reported.

1.12) Need for augmentation with oxytocin

There was no clear evidence of reduced augmentation between groups (average RR 0.77, 95% CI 0.46 to 1.29, five trials, 468 women). There was significant heterogeneity (I^2 = 71%; Tau^2 = 0.22) and we applied a random-effects model (Analysis 1.12). No single trial was responsible for the heterogeneity, although heterogeneity was reduced when the trials using oxytocin augmentation were excluded.

1.13) Perineal trauma

There was evidence of reduced perineal trauma in the massage group compared with the control (RR 0.88, 95% CI 0.79 to 0.98, one trial, 128 women) (Analysis 1.13).

1.14) Postpartum haemorrhage

There was no clear evidence of a difference between groups (RR 0.82, 95% CI 0.41 to 1.61, one trial, 171 women) (Analysis 1.14).

1.15) Emotional experience in labour (anxiety)

One trial (Chang 2002) examined women's experience of anxiety during labour. This small trial found less anxiety during the first stage of labour for women receiving massage compared to usual care (MD −16.27, 95% CI −27.03 to −5.51, one trial, 60 women) (Analysis 1.15).

There were no differences between groups during the second stage of labour (MD −8.97, 95% CI −20.79 to 2.85, one trial, 60 women), and third stage of labour (MD −4.57, 95% CI −14.04 to 4.90, one trial, 60 women).

Field 1997 reported improved outcomes for the massage group compared with the control, including less depressed mood (mean 6.9 versus 14.9), and lower stress levels (mean 5.2 versus 3.5).

1.16) Spontaneous vaginal birth (not pre-specified)

There were no clear differences between groups (average RR 1.12, 95% CI 0.87 to 1.44, four trials, 408 women); there was significant heterogeneity (I^2 = 73%; Tau^2 = 0.04) and we applied a random-effects model (Analysis 1.16). The heterogeneity was explained by the Levett 2016. This trial did not involve delivery of the intervention during labour; instead it was delivered during the antenatal period, with time prior to labour to practice the interventions learnt during this period.

1.17) Resuscitation of the newborn (not pre-specified)

There was evidence of reduced resuscitation of the newborn in the massage group (RR 0.43, 95% CI 0.23 to 0.79, two trials, 231 women) (Analysis 1.17).

2. Warm pack versus usual care

We included three trials with 191 women. In one trial there were four arms (Ganji 2013a), three of which were intervention groups: cold pack, versus intermittent hot and cold packs, versus heat packs only, versus a control of routine care. In this comparison, we have included the heat pack versus usual care arms and we disregarded the other two of the arms of the trial. No trial reported on the following outcomes: sense of control in labour; satisfaction with childbirth experience; satisfaction with pain relief; effect on mother/baby interaction; breastfeeding; assisted vaginal birth; caesarean section rate; side effects on mother/baby; Apgar score less than seven at five minutes; poor infant outcomes at long-term follow-up; and costs. One quasi-randomised trial (Behmanesh 2009) was included in the meta-analysis.

Primary outcomes

2.1) Pain intensity

2.1.1 First stage of labour

There was a very small reduction in pain intensity from warm packs (SMD −0.59, 95% CI −1.18 to −0.00; 191 women; three trials; I^2 = 75%; Tau^2 = 0.20; very low-quality evidence) (Analysis 2.1). Two trials used the VAS scale (Ganji 2013a; Taavoni 2013) and one quasi-randomised trial used the McGill pain questionnaire (Behmanesh 2009). For all these scales, low scores equated to less pain. Due to high levels of statistical heterogeneity we used a random-effects model.

2.1.2 Second stage of labour

There was a reduction in pain intensity during the second stage for women receiving warm packs compared with usual care (SMD −1.49, 95% CI −2.85 to −0.13; two trials; 128 women; I^2 = 91%; Tau^2 = 0.88). Due to high levels of statistical heterogeneity we used a random-effects model.

We conducted a sensitivity analysis and excluded the quasi-RCT (Behmanesh 2009) from the analysis (data not shown). The overall result was more precise with the exclusion of this trial and statistical heterogeneity as indicated by I^2 completely disappeared (I^2 = 0%).

Secondary outcomes

2.2 Length of labour

There was a reduction on the length of labour of over an hour (measured in minutes) for women receiving warm packs versus usual care (MD −66.15, 95% CI −91.83 to −40.47; two trials; 128 women; very low-quality evidence) (Analysis 2.2).

We conducted a sensitivity analysis and excluded the quasi-RCT (Behmanesh 2009) from the analysis (data not shown). The overall result was less precise with the exclusion of this trial.

3. Thermal manual methods versus usual care

We included one trial of 96 women (Ganji 2013a). In this trial there were four groups, three of which were intervention groups: cold pack, versus intermittent hot and cold packs, versus heat packs only, versus a control of routine care. In this comparison we have included three arms of the trial and disregarded the heat pack arm, so we have analysed the groups as two comparisons of: 1) cold packs versus usual care; and 2) intermittent hot and cold packs versus usual care. The 'usual care' group has been split between the two comparisons. The following outcomes were not reported: sense of control in labour; satisfaction with childbirth experience; satisfaction with pain relief; use of pharmacological pain relief; effect on mother/baby interaction; breastfeeding; caesarean section rates; side effects on mother/baby; Apgar score less than seven at five minutes; admission to neonatal intensive care; poor infant outcomes at long-term follow up; and costs.

Primary outcomes

3.1) Pain intensity

3.1.1 Coldpacks versus usual care

There was a reduction in pain intensity measured using the VAS during the first phase of labour for women receiving cold packs (MD −1.43, 95% CI −2.56 to −0.30 one trial, 48 women). Low scores equated to less pain in this scale.

3.1.1.2 Intermittent hot and cold packs versus usual care

There was a reduction in pain intensity measured using the VAS for women receiving intermittent hot and cold packs compared with usual care (MD −1.46, 95% CI −2.59 to −0.33, one trial, 48 women).

Overall, thermal manual methods resulted in a reduction in pain intensity (MD −1.44, 95% CI −2.24 to −0.65; one trial; 96 women; very low-quality evidence) (Analysis 3.1).

Secondary outcomes

3.2) Assisted vaginal birth

3.2.1 Coldpacks versus usual care

There was no clear evidence of differences between groups with assisted vaginal birth (RR 0.17, 95% CI 0.01 to 3.99, one trial, 48 women).

3.2.2 Intermittent hot and cold packs versus usual care

There was no clear evidence of differences between groups with assisted vaginal birth (RR 1.55, 95% CI 0.07 to 35.94, one trial, 48 women).

Overall, there was no clear difference between groups (RR 0.52, 95% CI 0.08 to 3.54; one trial, 96 women, very low-quality evidence) (Analysis 3.2)

3.3 Length of labour

3.3.1 Cold packs versus usual care

There was a reduction in the length of labour (reported in minutes) for women who received cold packs compared with usual care (MD −83.47, 95% CI −140.5 to −26.44, one trial, 48 women).

3.3.2 Intermittent hot and cold packs versus usual care

There was a reduction in the length of labour (reported in minutes) for women who received intermittent hot and cold packs compared with usual care (MD −72.91, 95% CI −130.40 to −15.36, one trial, 48 women).

Overall, there was a reduction in length of labour for the women who received thermal manual methods (MD −78.24, 95% CI −118.75 to −37.73; one trial, 96 women, very low-quality evidence) (Analysis 3.3).

3.4 Need for augmentation with oxytocin

3.4.1 Cold packs versus usual care

There was no clear evidence of differences between groups for augmentation rates (RR 1.00, 95% CI 0.55 to 1.82, one trial, 48 women).

3.4.2 Intermittent hot and cold packs versus usual care

There was no clear evidence of differences between groups for augmentation of labour (RR 0.89, 95% CI 0.51 to 1.55, one trial, 48 women).

Overall, there was no clear difference in augmentation rates between the groups (RR 0.94, 95% CI 0.63 to 1.41; one trial, 96 women) (Analysis 3.4).

3.5 Episiotomy

3.5.1 Cold packs versus usual care

There was no clear evidence of a difference between groups in episiotomy rates (RR 0.90, 95% CI 0.74 to 1.09, one trial, 48 women).

3.5.2 Intermittent hot and cold packs versus usual care

There was no clear evidence of a difference between groups in episiotomy (RR 1.03, 95% CI 0.9 to 1.19, one trial, 48 women).

Overall, there was no clear evidence of a difference between groups in episiotomy (RR 0.97, 95% CI 0.86 to 1.09; one trial, 96 women) (Analysis 3.5).

3.6 First degree tear (not pre-specified)

3.6.1 Cold packs versus usual care

There was no clear evidence of a difference between groups (RR 2.50, 95% CI 0.32 to 19.64, one trial, 48 women).

3.6.2 Intermittent hot and cold packs versus usual care

There was no clear evidence of a difference between groups (RR 0.50, 95% CI 0.03 to 7.49, one trial, 48 women).

Overall, there was no clear evidence of a difference between groups (RR 1.50, 95% CI 0.32 to 7.02, one trial, 96 women) (Analysis 3.6).

4. Massage versus music

We included one trial with 101 women. None of the following outcomes were reported: sense of control in labour; satisfaction with childbirth experience; satisfaction with pain relief; effect on mother/baby interaction; breastfeeding; assisted vaginal birth; caesarean section rates; augmentation; admission to neonatal intensive care; side effects on mother/baby; Apgar score less than seven at five minutes; poor infant outcomes at long-term follow up; and costs.

Primary outcomes

4.1) Pain intensity

The Taghinejad 2010 trial assessed this outcome using the VAS as a categorical variable and we reported on women with the most severe categories of pain. This trial found pain was reduced in the massage group versus music group (RR 0.40, 95% CI 0.18 to 0.89, one trial, 101 women, very low-quality evidence) (Analysis 4.1). Data on pain intensity were also reported as a median and interquartile range. The trial found evidence for benefit from massage with a reduction in the intensity of pain to 3.47 ± 0.879 compared with 4.1 ± 1.05 in the music group (P = 009).

Secondary outcomes

4.2) Use of pharmacological pain relief

There were no differences in the use of pharmacological pain relief in the massage group compared with music (RR 0.41, 95% CI 0.16 to 1.08, one trial, 101 women, very low-quality evidence) (Analysis 4.2).

Other comparisons

We found no trials which compared massage with other control interventions including hypnosis, biofeedback, intracutaneous or subcutaneous sterile water injection, immersion in water, aromatherapy, relaxation, and acupuncture or acupressure.

Subgroup analysis

We did not undertake subgroup analysis, based on insufficient reporting of trials with the variables of interest by outcome.

DISCUSSION

Summary of main results

We included 14 trials, 10 of which (1055 women) were included in the meta-analyses. Our analyses suggested a limited benefit from massage in relation to the primary outcome of pain intensity, sense of control in labour, satisfaction with childbirth, emotional experience during labour. Compared with usual care, massage was associated with reduced pain during the first stage of labour (very low-quality evidence), while its effect during the second and third phases of labour was not clear (low-quality evidence). Effects of massage versus usual care on assisted vaginal birth and caesarean delivery were unclear (very low-quality evidence). There was no clear benefit on the length of labour and use of pharmacological pain relief (very low-quality evidence). Compared with music, there was evidence of a small benefit from massage in relation to reduced pain (low-quality evidence), but no clear benefit in relation to reduced pharmacological pain relief (very low-quality evidence). Warm packs were associated with reduced pain in the first stage of labour and reduced length of labour (very low-quality evidence).

Currently there are only small numbers of trials included within each comparison. This limits the power of the review to detect meaningful differences between groups and analyses, therefore the limited benefits we found should be interpreted with caution.

Overall completeness and applicability of evidence

We found few trials on manual methods for management of labour pain, and these were mostly limited to trials of massage. The completeness and applicability of the evidence is limited by the small number of included trials. We identified the majority of trials as having a high risk of bias for at least one domain. One trial had a low risk of bias for all domains except for performance bias, which was unclear due to lack of blinding (Levett 2016). The majority of trials only included a limited number of relevant outcomes and failed to collect safety outcomes. Trials recruited both nulliparous and multiparous women at term, with the interventions administered in the labour ward environment. Trials were conducted in different countries, and this may reflect the use of particular modalities or techniques as part of the local culture. The systematic review illustrates variation in how these modalities were practiced, although it is unclear how generalisable the treatment protocols used in the research are to clinical practice or practice within the community.

Quality of the evidence

The risk of bias table (Figure 2, Figure 3) demonstrates massage has not been subject to consistent rigorous evaluation. The quality of reporting was poor in the majority of trials. Consequently, it is difficult to assess the overall risk of bias across trials and domains. For many trials, blinding of participants and the practitioner was not possible. Reporting indicated that some outcomes may have been influenced by a lack of blinding by the outcome assessor and consequently were rated at a high risk of bias. For self-reported outcomes we acknowledge that lack of blinding may impact on the pain intensity scores, however objective outcome measures — for example mode of birth — are less likely to be altered by detection bias. The small number of trials within comparisons, and the lack of high-quality trials, indicates there is currently insufficient evidence of a consistent treatment effect from massage trials included in the review. Three quasi-randomised trial were excluded from the

meta-analysis. The chief investigators of some trials were contacted to provide additional methodological and statistical information; however, only a few responses were obtained (Abasi 2009; Field 1997; Karami 2007).

The quality of evidence, using GRADE criteria, was low to very low for all outcomes (Summary of findings for the main comparison; Summary of findings 2; Summary of findings 3; Summary of findings 4). We downgraded the quality of evidence due to severe unexplained heterogeneity in some comparisons, indirectness of interventions, wide confidence intervals, and small samples sizes with few events.

Potential biases in the review process

We attempted to minimise bias during the review process. Two authors assessed the eligibility of trials, carried out data extraction and assessed the risk of bias. We are aware that some literature on relaxation therapies may not be published in mainstream journals and therefore may be excluded from the main databases. Our search was comprehensive, but we cannot rule out the possibility that some trials may have been missed.

Agreements and disagreements with other studies or reviews

Due to the lack of research examining the effect of massage on pain management in labour, we are limited in our ability to make comparisons with other trials and reviews. The included trials are based on one or a combination of the theoretical framework working with pain or effective pain relief. There are few trials reporting on a range of outcomes relating to pain management or working with pain. The comparison of massage with usual care provides some low-quality evidence of a relationship between reduced pain in labour with a sense of control in labour but not overall higher satisfaction with labour. This supports findings from other trials examining the relationship between pain and childbirth satisfaction more broadly (Waldenstrom 1999; Windridge 1999).

AUTHORS' CONCLUSIONS

Implications for practice

The limited data available suggest that massage may be a helpful modality for pain management in labour, and there is no evidence of harm. Overall, there are insufficient data to demonstrate whether massage provides an additive benefit when used in combination with usual care, or whether they are more effective than usual care. Due to the unclear risk of bias in the majority of trials, and the limited number of trials, further high-quality research needs to be undertaken.

Implications for research

Additional randomised controlled trials of massage for pain management in labour are needed. Trials should be adequately powered and include clinically relevant outcomes such as those described in this review. A methodological issue for trials of massage is the choice of an appropriate control group. It may be difficult to blind participants and midwives in such trials, and pragmatic designs should be considered to enable meaningful comparisons to be made. There is a need to improve the quality and reporting in future trials. In particular, the analysis and reporting should consider the person providing the intervention; for example, their training, length of experience and relationship to the woman. In addition, further research is required that includes data measuring neonatal outcomes and other maternal, clinical and safety outcomes.

ACKNOWLEDGEMENTS

We thank the editorial staff of the Cochrane Pregnancy and Childbirth for their help with preparing this review. In particular, Therese Dowswell, Anna Cuthbert and Lynn Hampson.

We thank Leanne Jones for her role as an author on the protocol and previous version of this review.

As part of the pre-publication editorial process, this review has been commented on by three peers (an editor and two referees who are external to the editorial team), a member of Cochrane Pregnancy and Childbirth's international panel of consumers and the group's Statistical Adviser.

This project was supported by the National Institute for Health Research (NIHR), via Cochrane Infrastructure (Cochrane Programme Grant) funding to Cochrane Pregnancy and Childbirth. The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Systematic Reviews Programme, NIHR, National Health Service or the Department of Health.

REFERENCES

References to studies included in this review

Abasi 2009 *{published data only}*

Abasi Z, Abedian Z. Study of the effect of massage therapy on the intensity of labor. *International Journal of Gynecology & Obstetrics* 2009;**107**(Suppl 2):S471.

Behmanesh 2009 *{published data only}*

Behmanesh F, Pasha H, Zeinalzadeh M. The effect of heat therapy on labor pain severity and delivery outcome in parturient women. *Iranian Red Crescent Medical Journal* 2009;**11**(2):188-92.

Bolbol-Haghighi 2016 *{published data only}*

Bolbol-Haghighi N, Masoumi SZ, Kazemi F. Effect of massage therapy on duration of labour: A randomized controlled trial. *Journal of Clinical and Diagnostic Research* 2016;**10**(4):QC12-5.

Chang 2002 *{published data only}*

Chang MY, Chen CH, Huang KF. A comparison of massage effects on labor pain using the McGill pain questionnaire. *Journal of Nursing Research* 2006;**14**(3):190-7.

* Chang MY, Wang SY, Chen CH. Effects of massage on pain and anxiety during labour: a randomized controlled trial in Taiwan. *Journal of Advanced Nursing* 2002;**38**(1):68-73.

Field 1997 *{published data only}*

Field T, Hernandez Reif M, Taylor S, Quintino O, Burman I. Labor pain is reduced by massage therapy. *Journal of Psychosomatic Obstetrics and Gynaecology* 1997;**18**(4):286-91.

Ganji 2013a *{published data only}*

* Ganji Z, Shirvani MA, Rezaei-Abhari F, Danesh M. The effect of intermittent local heat and cold on labor pain and child birth outcome. *Iranian Journal of Nursing and Midwifery Research* 2013;**18**(4):298-303.

Shirvani MA, Ganji J. Comparison of separate and intermittent heat and cold therapy in labour pain management. *Nursing Practice Today* 2016;**3**(4):179-86.

Shirvani MA, Ganji J. The influence of cold pack on labour pain relief and birth outcomes: a randomised controlled trial. *Journal of Clinical Nursing* 2014;**23**(17/18):2473-81.

Janssen 2008 *{published data only}*

* Janssen P, Shroff F, Jaspar P. Massage therapy and labor outcomes: a randomized controlled trial. *International Journal of Therapeutic Massage & Bodywork* 2012;**5**(4):15-20.

NCT00611221. Massage therapy study: massage therapy and labour outcomes. clinicaltrials.gov/ct2/show/record/NCT00611221 (first received 28 January 2008).

Karami 2007 *{published data only}*

Karami NK, Safarzedeh A, Fathizadeh N. Effect of massage therapy on severity of pain and outcome of labor in primipara. *Iranian Journal of Nursing and Midwifery Research* 2007;**12**(1):6-9.

Kimber 2008 *{published data only}*

ISRCTN43151584. Alternative labour pain strategies study. isrctn.com/ISRCTN43151584 (first received 21 September 2005).

* Kimber L, McNabb M, McCourt C, Haines A, Brocklehurst P. Massage or music for pain relief in labour: a pilot randomised placebo controlled trial. *European Journal of Pain* 2008;**12**(8):961-9.

Levett 2016 *{published data only}*

Levett K, Smith CA, Bensoussan A, Dahlen HG. Complementary therapies for labour and birth study: a randomised controlled trial of antenatal integrative medicine for pain management in labour. *BMJ Open* 2016;**6**:e010691.

Mortazavi 2012 *{published data only}*

Mortazavi SH, Khaki S, Moradi R, Heidari K, Vasegh Rahimparvar SF. Effects of massage therapy and presence of attendant on pain, anxiety and satisfaction during labor. *Archives of Gynecology and Obstetrics* 2012;**286**(1):19-23.

Silva 2013 *{published data only}*

NCT01392053. Massage for pain relief during the active phase of labor. clinicaltrials.gov/ct2/show/NCT01392053 (first received 11 July 2011).

* Silva Gallo RB, Santana LS, Jorge Ferreira CH, Marcolin AC, Polineto OB, Duarte G, et al. Massage reduced severity of pain during labour: a randomised trial. *Journal of Physiotherapy* 2013;**59**(2):109-16.

Taavoni 2013 *{published data only}*

Taavoni S, Abdolahian S, Haghani H. Effect of pelvic tilt by birth ball usage, sacrum-perinea heat therapy and combination of them on active phase of physiologic labor. International Confederation of Midwives 30th Triennial Congress. Midwives: Improving Women's Health; 2014 June 1-4; Prague, Czech Republic. 2014:C169.

* Taavoni S, Abdolahian S, Haghani H. Effect of sacrum-perineum heat therapy on active phase labor pain and client satisfaction: A randomized, controlled trial study. *Pain Medicine (United States)* 2013;**14**(9):1301-6.

Taavoni S, Abdolahian S, Haghani H. Sacrum-perinea heat therapy for physiologic labor pain management: a randomized control trial study. *Regional Anesthesia and Pain Medicine* 2011;**36**(5 Suppl 2):E199.

Taghinejad 2010 *{published data only}*

Taghinejad H, Delpisheh, Suhrabi Z. Comparison between massage and music therapies to relieve the severity of labor pain. *Women's Health* 2010;**6**(3):377-81.

References to studies excluded from this review

Akbarzadeh 2014 *{published data only}*

* Akbarzadeh M, Masoudi Z, Hadianfard MJ, Kasraeian M, Zare N. Comparison of the effects of maternal supportive

care and acupressure (BL32 acupoint) on pregnant women's pain intensity and delivery outcome. *Journal of Pregnancy* 2014;**2014**:Article ID: 129208.

Akbarzadeh M, Masoudi Z, Zare N, Kasraeian M. Comparison of the effects of maternal supportive care and acupressure (at BL32 acupoint) on labor length and infant's Apgar score. *Global Journal of Health Science* 2016;**8**(3):236-44.

Bastani 2016 *{published data only}*

Bastani F. Effect of acupressure on maternal anxiety in women with gestational diabetes mellitus: a randomized clinical trial. *Clinical Nursing Research* 2016;**25**(3):325-41.

Dehcheshmeh 2015 *{published data only}*

* Dehcheshmeh FS, Rafiei H. Complementary and alternative therapies to relieve labor pain: a comparative study between music therapy and Hoku point ice massage. *Complementary Therapies in Clinical Practice* 2015;**21**(4):229-32.

IRCT138903162265N2. Comparing effect of music therapy and Hoku point ice massage on labor pain in pregnant women in Hajar hospital maternity ward. en.search.irct.ir/view/3299 (first received: 26 June 2012.).

Fili 2017 *{published data only}*

Fili AA, Askari M, Vahhabi S, Bagheri P, Dashtinejhad E. Comparison of effect of massage therapy with jasmine oil and aroma therapy with jasmine oil in reducing delivery pain. *Iranian Journal of Obstetrics, Gynecology and Infertility* 2017;**20**(3):40-7.

Hajiamini 2012 *{published data only}*

Hajiamini Z, Masoud SN, Ebadi A, Mahboubh A, Matin AA. Comparing the effects of ice massage and acupressure on labor pain reduction. *Complementary Therapies in Clinical Practice* 2012;**18**(3):169-72.

Mafetoni 2015 *{published data only}*

Mafetoni RR, Shimo AKK. Effects of acupressure on progress of labor and cesarean section rate: randomized clinical trial. *Revista de Saude Publica* 2015;**49**(9):1-9.

Nourbakhsh 2012 *{published data only}*

Nourbakhsh S, Taavoni S. Effect of aromatherapy on labor pain: a randomized control trial study in bandarabbas. *European Psychiatry* 2012;**27**(Suppl 1):1.

Ozgoli 2016 *{published data only}*

Ozgoli G, Sedigh Mobarakabadi S, Heshmat R, Alavi Majd H, Sheikhan Z. Effect of LI4 and BL32 acupressure on labor pain and delivery outcome in the first stage of labor in primiparous women: A randomized controlled trial. *Complementary Therapies in Medicine* 2016;**29**:175-80.

Torkzahrani 2017 *{published data only}*

Torkzahrani S, Mahmoudikohani F, Saatchi K, Sefidkar R, Banaei M. The effect of acupressure on the initiation of labor: A randomized controlled trial. *Women and Birth* 2017;**30**:46-50.

Valiani 2010 *{published data only}*

Valiani M, Shiran E, Kianpour M, Hasanpour M. Reviewing the effect of reflexology on the pain and certain features and outcomes of the labour on the primiparous women. *Iranian Journal of Nursing and Midwifery Care* 2010;**15**(Special Issue):302-10.

Yildirim 2004 *{published data only}*

Yildirim G, Sahin NH. The effect of breathing and skin stimulation techniques on labour pain perception of Turkish women. *Pain Research & Management* 2004;**9**(4):183-7.

References to studies awaiting assessment

Askari 2016 *{published data only}*

Askari M, Alavi A, Dashtinezhad E. Effect of back massage with sesames oil on pain and length of delivery in primiparous women. *Iranian Journal of Obstetrics, Gynecology and Infertility* 2016;**18**(183):12-9.

Azima 2012 *{published data only}*

* Azima S, Kavini M, Gholami J. The comparison of superficial and vibration massages on backache during labor in primiparous women. *Iranian Journal of Reproductive Medicine* 2012;**10 Suppl 1**:82.

Kaviani M, Gholami Z, Azima S, Abbasnia K, Rajaifard A. The comparison of superficial and vibration massages on backache during labor in primiparous women. *Iranian Journal of Obstetrics, Gynecology and Infertility* 2011;**14**(5):43-8.

Can 2015 *{published data only}*

Can HO, Saruhan A. Evaluation of the effects of ice massage applied to large intestine 4 (hegu) on postpartum pain during the active phase of labor. *Iranian Journal of Nursing and Midwifery Research* 2015;**20**(1):129-38.

Dolatian 2011 *{published data only}*

Dolatian M. The effect of reflexology on pain intensity of labor. en.search.irct.ir/view/3591 2010.

Dolatian M, Hasanpour A, Heshmat R, Alavi H. The effect of reflexology on pain intensity of labor. *Journal of Zanjan University of Medical Sciences and Health Services* 2010;**18**(72):52-61.

* Dolatian M, Hasanpour A, Montazeri S, Heshmat R, Alavi H. The effect of reflexology on pain intensity and duration of labor on primiparas. *Iranian Red Crescent Medical Journal* 2011;**13**(7):475-9.

Faezah 2010 *{published data only}*

Faezah D, Fatemeh V, Adel H, Nafiseh D. The effects of massage therapy on anxiety and satisfaction of pregnant women during labour - a randomized clinical trial. *Journal of Psychosomatic Obstetrics and Gynecology* 2010;**31**(s1):107.

Hanjani 2013 *{published data only}*

Hanjani SM. The effect of foot reflexology on the outcomes of labor on primiparous. *Journal of Nursing and Midwifery of Urmia University of Medical Sciences* 2012;**10**(5):700-5.

* Hanjani SM, Tourzani ZM, Shoghi M, Ahmadi G. Effect of foot reflexology on pain intensity and duration of labor on primiparous. *Koomesh* 2013;**14**(2):166-71.

Mehdizadeh Tourzani Z, Moghimi Hanjani S, Shoghi M, Ahmadi G. The effect of foot reflexology on anxiety during of labor on primiparous. *Iranian Journal of Reproductive Medicine* 2013;**11**(5 Suppl 2):30.

Moghimi Hanjani S, Mehdizadeh Tourzani Z, Shoghi M, Ahmadi G. The effect of foot reflexology on pain intensity and duration of labor on primiparous. *Iranian Journal of Reproductive Medicine* 2013;**11**(5 Suppl 2):97.

Moghimi-Hanjani S, Mehdizadeh-Tourzani Z, Shoghi M. The effect of foot reflexology on anxiety, pain, and outcomes of the labor in primigravida women. *Acta Medica Iranica* 2015;**53**(8):507-11.

Haseli 2014 *{published data only}*

Haseli A, Jahdi F, Egdampour F, NaysaniSamani L, Haghani H. Effects of effleurage massage plus breathing techniques on childbirth satisfaction in primiparous women referring to lolagar Hospital in Tehran. *Iranian Journal of Reproductive Medicine* 2014;**12**(6):(Suppl I).

Jenabi 2012 *{published data only}*

Jenabi E, Mohajeran MH, Torkamani M. The effect of reflexology on relieving the labor pain. *Iranian Journal of Obstetrics, Gynecology and Infertility* 2012;**14**(8):23-7.

Kuo 2014 *{published data only}*

Kuo SC, Huang TL. Effectiveness of a hot pebble packing attenuating discomforts in the first stage of labor. International Confederation of Midwives 30th Triennial Congress. Midwives: Improving Women's Health; 2014 June 1-4; Prague, Czech Republic. 2014:C427.

Mirzaee 2010 *{published data only}*

Mirzaee F, Kaviani M, Jafari P. Effect of reflexology on anxiety level in nulliparous women. *HAYAT* 2010;**16**(1):65-71.

Mohammadkhani 2012 *{published data only}*

Mohammadkhani Shahri L, Abbaspoor Z, Aghel N, Mohammadkhani Shahri H. Effect of massage aromatherapy with lavender oil on pain intensity of active phase of labor in nulliparous women. *Journal of Medicinal Plants* 2012;**2**(42):167-76.

Sereshti 2013 *{published data only}*

Sereshti M, Asefi F, Shabanian M, Banaeian S. Comparing the effects of massage and intra intramuscular pethidine on pain relief in the stages of labor and the length of labor. *Iranian Journal of Obstetrics, Gynecology and Infertility* 2013;**16**(80):6-16.

Shafai 2013 *{published data only}*

Shafai FS, Kazemi S, Ghojazadeh M. Comparing maternal outcomes in nulliparous women in labor in physiological and conventional labor: a randomized clinical trial. *Journal of Mazandaran University of Medical Sciences* 2013;**23**(97):122-31.

Zhang 2000 *{published data only}*

Zhang C. The application of foot reflexology in relieving labor pains. *China Reflexology Journal* 2000;**1**:9.

References to ongoing studies

Quintana 2011 *{published data only}*

NCT01392053. Massage for pain relief during the active phase of labor. clinicaltrials.gov/ct2/show/results/NCT01392053 (first received 12 July 2011).

Quintana 2012 *{published data only}*

NCT01389128. Non-pharmacological resources in assisting labor. clinicaltrials.gov/ct2/show/NCT01389128 (first received 7 July 2011).

Ying 2009 *{published data only}*

ChiCTR-INR-16009158. RCT on the effectiveness of childbirth massage program in Chinese primigravida during intrapartum pain relief management. chictr.org.cn/hvshowproject.aspx?id=10281 (first received 2 September 2009).

Additional references

Aasheim 2017

Aasheim V, Nilsen ABV, Reinar LM, Lukasse M. Perineal techniques during the second stage of labour for reducing perineal trauma. *Cochrane Database of Systematic Reviews* 2017, Issue 6. [DOI: 10.1002/14651858.CD006672.pub3]

Adams 2009

Adams J, Lui C-W, Sibbritt D, Broom A, Wardle J, Homer C, et al. Women's use of complementary and alternative medicine during pregnancy: a critical review of the literature. *Birth* 2009;**36**(3):237-45.

Anim-Somuah 2005

Anim-Somuah M, Smyth RMD, Howell CJ. Epidural versus non-epidural or no analgesia in labour. *Cochrane Database of Systematic Reviews* 2005, Issue 4. [DOI: 10.1002/14651858.CD000331.pub2]

Barragán 2011

Barragán Loayza IM, Solà I, Juandó Prats C. Biofeedback for pain management during labour. *Cochrane Database of Systematic Reviews* 2011, Issue 6. [DOI: 10.1002/14651858.CD006168.pub2]

Bennett 1999

Bennett VR, Brown LK. Myles Textbook for Midwives. 13th Edition. London: Churchill Livingstone, 1999.

Borggren 2007

Borggren CL. Pregnancy and chiropractic: a narrative review of the literature. *Journal of Chiropractic Medicine* 2007;**6**(2):70-74.

Botting 1997

Botting D. Review of literature on the effectiveness of reflexology. *Complementary Therapies in Nursing and Midwifery* 1997;**3**:123-30.

Buckley 2003

Buckley SJM, Dip O. Undisturbed birth. Nature's blueprint for ease and ecstasy. *Journal of Prenatal & Perinatal Psychology & Health* 2003;**17**(4):261.

Buckley 2015

Buckley SJ. Executive summary of hormonal physiology of childbearing: evidence and implications for women, babies, and maternity care. *Journal of Perinatal Education* 2015;**24**(3):145.

Cluett 2009

Cluett ER, Burns E. Immersion in water in labour and birth. *Cochrane Database of Systematic Reviews* 2009, Issue 2. [DOI: 10.1002/14651858.CD000111.pub3]

Cochrane 2006

Berman B. Cochrane Complementary Medicine Field. About The Cochrane Collaboration (Fields) 2006; Vol. 1.

Craig 2006

Craig LH, Svircev A, Haber M, Juncos JL. Controlled pilot study of the effects of neuromuscular therapy in patients with Parkinson's disease. *Movement Disorders* 2006;**21**(12):2127-33.

Denner 2009

Denner SS. The Science of Energy Therapies and Contemplative Practice: A Conceptual Review and the Application of Zero Balancing. *Holistic Nursing Practice* 2009;**23**(6):315-334.

Derry 2011

Derry S, Straube S, Moore RA, Hancock H, Collins SL. Intracutaneous or subcutaneous sterile water injection for relieving pain in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 5. [DOI: 10.1002/14651858.CD009107]

Dommerholt 2012

Dommerholt J, Bron C. Myofascial pain syndrome: trigger points. *Journal of Musculoskeletal Pain* 2012;**20**(4):321-30.

Dowswell 2009

Dowswell T, Bedwell C, Lavender T, Neilson JP. Transcutaneous electrical nerve stimulation (TENS) for pain relief in labour. *Cochrane Database of Systematic Reviews* 2009, Issue 2. [DOI: 10.1002/14651858.CD007214.pub2]

Ernst 1997

Ernst E, Koeder K. An overview of reflexology. *European Journal of General Practice* 1997;**3**:52-7.

Fang 2013

Fang L, Fang M. Research progress on the standardization of Chinese Tuina therapy: A short review. *Chinese Journal of Integrative Medicine* 2013;**19**(1):68-72.

Field 2005

Field T, Hernandez-Reif M, Diego M, Schanberg S, Kuhn C. Cortisol decreases and serotonin and dopamine increase following massage therapy. *International Journal of Neuroscience* 2005;**115**(10):1397-413.

Field 2007

Field T, Diego M, Hernandez-Reif M. Massage therapy research. *Developmental Review* 2007;**27**(1):75-89.

Field 2010

Field T. Pregnancy and labor massage. *Expert Review of Obstetrics & Gynecology* 2010;**5**(2):177-81. [DOI: 10.1586/eog.10.12]

Ganji 2013b

Ganji Z, Shirvani MA, Rezaei-Abhari F, Danesh M. The effect of intermittent local heat and cold on labor pain and child birth outcome. *Iranian Journal of Nursing and Midwifery Research* 2013;**18**(4):298-303.

Goodman 2004

Goodman P, Mackey MC, Tavakoli AS. Factors related to childbirth satisfaction. *Journal of Advanced Nursing* 2004;**46**(2):211-9.

Greggus 2004

Greegus P. *Journal of Bodywork and Movement Therapies* 2004;**8**:58-71.

Hall 2012

Hall HG, McKenna LG, Griffiths DL. Midwives' support for complementary and alternative medicine: a literature review. *Women and Birth* 2012;**25**(1):4-12. [DOI: 10.1016/j.wombi.2010.12.005]

Hayes 2000

Hayes KW. Manual for Physical Agents. 5th Edition. New Jersey: Prentice Hall Health, 2000.

Higgins 2011

Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org.

Hodnett 2002

Hodnett ED. Pain and women's satisfaction with the experience of childbirth: a systematic review. *American Journal of Obstetrics and Gynecology* 2002;**186**(5):S160-S172.

Janssens 1992

Janssens LA. Trigger point therapy. *Problems in Veterinary Medicine* 1992;**4**(1):117-24.

Jones 2011

Jones L, Dou L, Dowswell T, Alfirevic Z, Neilson JP. Pain management for women in labour: generic protocol. *Cochrane Database of Systematic Reviews* 2011, Issue 6. [DOI: 10.1002/14651858.CD009167]

Jones 2012

Jones L, Othman M, Dowswell T, Alfirevic Z, Gates S, Newburn M, et al. Pain management for women in labour: an overview of systematic reviews. *Cochrane Database of Systematic Reviews* 2012, Issue 3. [DOI: 10.1002/14651858.CD009234.pub2]

King 2003

King HH, Tettambel MA, Lockwood MD, Johnson KH, Arsenault DA, Quist R. Osteopathic manipulative treatment in prenatal care: a retrospective case control design study. *Journal of the American Osteopathic Association* 2003;**103**(12):577-82.

Klomp 2011

Klomp T, van Poppel M, Lazet J, Di Nisio M. Inhaled analgesia for pain management in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 10. [DOI: 10.1002/14651858.CD009351]

Leap 1997

Leap N. A Midwifery Perspective on Pain in Labour [MSc Thesis]. South Bank University, 1997.

Leap 2010

Leap N. Journey to confidence: women's experiences of pain in labour and relational continuity of care. *Journal of Midwifery and Women's Health* 2010;**55**:234-42.

Long 2009

Long AF. The potential of complementary and alternative medicine in promoting well-being and critical health literacy: a prospective, observational study of shiatsu. *BMC Complementary and Alternative Medicine* 2009;**9**:19.

Lundgren 1998

Lundgren I, Dahlberg K. Women's experience of pain during childbirth. *Midwifery* 1998;**14**:105-10.

Madden 2016

Madden K, Middleton P, Cyna AM, Matthewson M, Jones L. Hypnosis for pain management during labour and childbirth. *Cochrane Database of Systematic Reviews* 2016, Issue 5. [DOI: 10.1002/14651858.CD009356.pub3]

Maimburg 2016

Maimburg RD, Vaeth M, Dahlen H. Women's experience of childbirth-a five year follow up of the randomised controlled trial (Ready for Child Trial). *Women and Birth* 2016;**16**(5):450-54.

Martin 2013

Martin CJH, Robb Y. Women's views about the importance of education in preparation for childbirth. *Nurse Education in Practice* 2013;**13**(6):512-8.

McCaffery 1989

McCaffery M, Beebe A. Pain: Clinical Manual for Nursing Practice. St Louis: C.V. Mosby, 1989.

McCrea 2000

McCrea H, Wright M, Stringer M. Psychosocial factors influencing personal control in pain relief. *Indian Journal of Nursing Studies* 2000;**37**:493-503.

McNabb 2006

McNabb MT, Kimber L, Haines A, McCourt C. Does regular massage from late pregnancy to birth decrease maternal pain perception during labour and birth? — A feasibility study to investigate a programme of massage, controlled breathing and visualization, from 36 weeks of pregnancy until birth. *Complementary Therapies in Clinical Practice* 2006;**12**(3):222-31.

Melzack 1965

Melzack R, Wall PD. Pain mechanisms: a new theory. *Science* 1965;**150**:971-9.

Melzack 1984

Melzack R. The myth of painless childbirth. *Pain* 1984;**19**:331-7.

Melzack 2001

Melzack R. Pain and neuromatrix in the brain. *Journal of Dental Education* 2001;**65**:1378-82.

Morgan 1982

Morgan BM, Bulpitt CJ, Clifton P, Lewis PJ. Analgesia and satisfaction in childbirth (the Queen Charlotte's 1000 mother survey). *Lancet* 1982;**2**(8302):808-10.

Nagata 1997

Nagata CB, Tsujii Y. Myotherapy: a new approach to the treatment of muscle pain syndromes. *Journal of Manual & Manipulative Therapy* 1997;**5**(2):87-90.

Niven 2000

Niven C, Murphy-Black T. Memory for labor pain: a review of the literature. *Birth* 2000;**27**:244-53.

Novikova 2011

Novikova N, Cluver C. Local anaesthetic nerve block for pain management in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 7. [DOI: 10.1002/14651858.CD009200]

Othman 2011

Othman M, Jones L, Neilson JP. Non-opioid drugs for pain management in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 7. [DOI: 10.1002/14651858.CD009223]

Porth 1990

Porth C. Pathophysiology: Concepts of Altered Health States. 3rd Edition. Philidelphia: JB Lippincott, 1990.

Posadzki 2011

Posadzki P, Ernst E. Osteopathy for musculoskeletal pain patients: a systematic review of randomized controlled trials. *Clinical Rheumatology,* 2011;**30**(2):285-291.

Rapaport 2012

Rapaport MH, Schettler P, Bresee C. A preliminary study of the effects of repeated massage on hypothalamic–pituitary–adrenal and immune function in healthy individuals: a study of mechanisms of action and dosage. *Journal of Alternative and Complementary Medicine* 2012;**18**(8):789-97.

RevMan 2014 [Computer program]

The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (RevMan). Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.

Rich 2002

Rich GJ. Massage Therapy: The Evidence for Practice. 1st Edition. Philidelphia: Elsevier, 2002.

Robinson 2011

Robinson N, Lorenc A, Liao X. The evidence for Shiatsu: a systematic review of Shiatsu and acupressure. *BMC Complementary and Alternative Medicine* 2011;**11**(1):88.

Seifert 2011

Seifert F, Maihöfner C. Functional and structural imaging of pain-induced neuroplasticity. *Current Opinion in Anesthesiology* 2011;**24**(5):515-23.

Shirvani 2014

Shirvani MA, Ganji J. The influence of cold pack on labour pain relief and birth outcomes: a randomised controlled trial. *Journal of Clinical Nursing* 2014;**23**(17/18):2473-81.

Simmonds 2012

Simmonds N, Miller P, Gemmell H. A theoretical framework for the role of fascia in manual therapy. *Journal of Bodywork and Movement Therapies* 2012;**16**(1):83-93.

Simmons 2007

Simmons SW, Cyna AM, Dennis AT, Hughes D. Combined spinal-epidural versus epidural analgesia in labour. *Cochrane Database of Systematic Reviews* 2007, Issue 3. [DOI: 10.1002/14651858.CD003401.pub2]

Smith 2006

Smith CA, Collins CT, Cyna AM, Crowther CA. Complementary and alternative therapies for pain management in labour. *Cochrane Database of Systematic Reviews* 2006, Issue 4. [DOI: 10.1002/14651858.CD009232]

Smith 2011a

Smith CA, Collins CT, Crowther CA, Levett KM. Acupuncture or acupressure for pain management in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 7. [DOI: 10.1002/14651858.CD009232]

Smith 2011b

Smith CA, Collins CT, Crowther CA. Aromatherapy for pain management in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 7. [DOI: 10.1002/14651858.CD009215]

Smith 2011c

Smith CA, Levett KM, Collins CT, Crowther CA. Relaxation techniques for pain management in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 12. [DOI: 10.1002/14651858.CD009514]

Steel 2012

Steel A, Adams J, Sibbritt D, Broom A, Gallois C, Frawley J. Utilisation of complementary and alternative medicine (CAM) practitioners within maternity care provision: results from a nationally representative cohort study of 1,835 pregnant women. *BMC Pregnancy and Childbirth* 2012;**12**(1):146.

Steel 2014

Steel A, Adams J, Sibbritt D, Broom A, Frawley J, Gallois CT. he influence of complementary and alternative medicine use in pregnancy on labor pain management choices: results from a nationally representative sample of 1,835 women. *Journal of Alternative and Complementary Medicine* 2014;**20**(2):87-97.

Trout 2004

Trout KK. The neuromatrix theory of pain: implications for selected non-pharmacological methods of pain relief for labor. *Journal of Midwifery and Women's Health* 2004;**49**(6):482-8.

Ullman 2010

Ullman R, Smith LA, Burns E, Mori R, Dowswell T. Parenteral opioids for maternal pain relief in labour. *Cochrane Database of Systematic Reviews* 2010, Issue 9. [DOI: 10.1002/14651858.CD007396.pub2]

Uvnäs-Moberg 2014

Uvnäs-Moberg K, Handlin L, Petersson M. Self-soothing behaviors with particular reference to oxytocin release induced by non-noxious sensory stimulation. *Frontiers in Psychology* 2014;**5**:1-16.

Waldenstrom 1999

Waldenstrom U. Experience of labor and birth in 1111 women. *Journal of Psychosomatic Research* 1999;**5**:471-82.

Wang 2005

Wang SM, Zinno PD, Fermo L, William K, Caldwell-Andrews AA, Bravemen F, et al. Complementary and Alternative Medicine for Low-Back Pain in Pregnancy: A Cross-Sectional Survey. *Journal of Alternative and Complementary Medicine* 2005;**11**(3):459-464.

Wang 2008

Wang MY, Tsai PS, Lee PH, Chang WY, Yang CM. The efficacy of reflexology: systematic review. *Journal of Advanced Nursing* 2008;**62**(5):512-20.

Windridge 1999

Windridge KC, Berryman JC. Women's experiences of giving birth after 35. *Birth* 1999;**26**:16-23.

References to other published versions of this review

Smith 2012

Smith CA, Levett KM, Collins CT, Jones L. Massage, reflexology and other manual methods for pain management in labour. *Cochrane Database of Systematic Reviews* 2012, Issue 2. [DOI: 10.1002/14651858.CD009290.pub2]

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Abasi 2009

Methods	Single-blind RCT.
Participants	62 primiparous women Inclusion criteria: • a gestational age of 37-42 weeks, • a singleton pregnancy, • vertex presentation, • spontaneous onset of labour, • cervical dilatation 2-3 cm • planning a vaginal delivery. Exclusion criteria: • fever, • infection, • disc injury, • skin condition, • broken bones. The trial was undertaken at the Bentolhoda maternity hospital, Bojnord, Iran, during 2005.
Interventions	Back massage was continuous, firm and steady for 30 minutes during each phase of labour. Massage applied from sacral spine upward to the lumbar spine, then back down to the sacrum. A masseuse applied the intervention. No other details reported. Control: standard care, no other details provided.
Outcomes	Pain intensity measured using the VAS.
Notes	Dates of trial: 2005. Funding: not reported. Declaration of interest: not mentioned.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Date of admission.
Allocation concealment (selection bias)	High risk	Date of admission. Researchers enrolling participants could possibly foresee assignments and thus introduce selection bias.
Blinding of participants and personnel (performance bias) All outcomes	High risk	No participants or other trial personnel were blind to group allocation.
Blinding of outcome assessment (detection bias)	Low risk	The assessor was blinded.

Abasi 2009 *(Continued)*

All outcomes		
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Unclear from paper.
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable but appears free of selective reporting.
Other bias	Low risk	No other biases apparent.

Behmanesh 2009

Methods	RCT.
Participants	64 nulliparous women aged 18-35 years old, at the beginning of the active stage of labour, Inclusion criteria: • gestational age 37-41 weeks, • single pregnancy, • cephalic presentation of the fetus. Attending a hospital in Iran.
Interventions	The heat therapy group used a warm bag for the low back from 3-4 cm dilation until the end of first stage of labour, and then again for the perineum at the second stage. This is in addition to routine care.
Outcomes	Severity of pain using McGill Pain Questionnaire, at dilations of 3-4 cm, 6-7 cm and 9-10 cm and at the end of second stage. Apgar scores, maternal bleeding status, uterine contraction.
Notes	We contacted the authors for more information about method of randomisation. Dates of trial: 2006-2007. Funding: not reported. Declaration of interest: none declared.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Alternate allocation of participants.
Allocation concealment (selection bias)	High risk	Alternate allocation of participants, no allocation concealment.
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Investigators undertook assessments.

Behmanesh 2009 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	No attrition.
Selective reporting (reporting bias)	Unclear risk	No protocol, not all outcomes reported.
Other bias	Unclear risk	Baseline characteristics not reported

Bolbol-Haghighi 2016

Methods	RCT.
Participants	100 women aged between 18-45 years, Inclusion criteria: • singleton live fetuses • reactive NST at admission in labour. Fatemieh Hospital, Shahroud, Iran.
Interventions	Intervention included massage plus partogram. Massage to 'under belly', upper thighs, sacral region, shoulders and legs for minimum of 30 minutes by midwifery students. Control group included usual care plus partogram. Midwifery students were also randomly allocated for half to received instructions about massage techniques. All midwifery students were given instruction about how to draw a partogram.
Outcomes	Duration of labour, type of delivery, oxytocin augmentation, Apgar score at 1 and 5 minutes.
Notes	No protocol available, not clear if all outcome measures were collected. Dates of trial: October 2013 to June 2015. Funding: research deputy of the Shahroud University of Medical Sciences. Declaration of interest: none.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Women were reported to be allocated randomly using a random number table (block size not defined).
Allocation concealment (selection bias)	Unclear risk	Reported concealing allocation with opaque envelopes. It was also reported that midwives were randomised and the sequence of midwives was randomised, but it is unclear what this involved.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and personnel were not blinded.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Reported that data analyst was blind, but outcome assessment was performed by staff providing care.

Bolbol-Haghighi 2016 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No loss to follow up, but unclear if there were any missing data.
Selective reporting (reporting bias)	Unclear risk	No protocol available, so it is unclear if all outcomes collected were reported.
Other bias	High risk	Some baseline imbalances between groups with regard to age and education.

Chang 2002

Methods	RCT — sequentially recruited and randomly allocated to 2 groups, massage and standard care.
Participants	60 women recruited from a regional hospital in southern Taiwan between September 1999 and January 2000. Inclusion criteria: • primiparous; 37-42 weeks' pregnant; • normal pregnancy and childbirth to date; • partner present during labour; • dilation no more than 4 cm. Exclusion criteria: not described.
Interventions	Massage: couples were given detailed description of the massage protocol. Then the primary researcher gave massage during uterine contractions in each phase and taught the method to the partner. Received directional, reasonably firm and rhythmic massage for 30 minutes, comprising abdominal effleurage, sacral pressure and shoulder and back kneading. Subject chose most useful site at time. The same 30-minute massage was repeated in phase 2 and 3. After the 30-minute massage at each stage, pain and anxiety states were evaluated to assess the immediate effects of the massage. The partners repeated the massage at each phase of labour after the 30-minute massage by the researcher was complete. Control: standard care and 30 minutes of the researcher's attendance and casual conversation during each phase.
Outcomes	Pain intensity assessed using the present behavioural intensity scale on a scale of 0–5 (0 represents no pain, 1 mild, 2 discomforting, 3 distressing, 4 horrible, and 5 excruciating pain); anxiety measured using the visual analogue scale for anxiety in all 3 phases of labour; need for pain relief. Satisfaction with childbirth assessed along an unspecified 5 point scale
Notes	Dates of trial: September 1999 to January 2000. Funding: not mentioned. Declaration of interest: not mentioned.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	4 balls were used for sequence generation: 2 with E (experimental) and 2 with C (control) printed on them.

Chang 2002 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Reported as concealed but method not reported.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding not possible.
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Clearly described.
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable but appears free of selective reporting.
Other bias	Low risk	No other biases apparent.

Field 1997

Methods	RCT of massage plus breathing exercises versus breathing alone.
Participants	28 subjects recruited from Lamaze classes during the last trimester of pregnancy. The trial was undertaken in Florida, USA. No inclusion or exclusion criteria reported.
Interventions	Massage therapy plus breathing exercises learned in prenatal classes. Massage taught to birth partner for a mean of 10 minutes by massage therapist. At approximately 3-5 cm dilation, subjects received 20 minutes of head, shoulder/back, hand and foot massage, respectively. Moderate pressure and smooth movements specifically to relax stressed areas of labouring body. Clockwise circular stroking movements for 5-minute consecutive periods in each of the 4 regions while woman lying on side. Repeated every hour for 5 hours. The attention control consisted of breathing exercises learned in prenatal classes.
Outcomes	Mood sates depression scale, pain, stress level, labour and neonatal measures.
Notes	Dates of trial: not mentioned, received 1996. Funding: NIMH Research Scientist Award (#MH00331) and NIMH Research Grant (#MH46586) and grant from Johnson & Johnson. Declaration of interest: not mentioned.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Table of numbers.
Allocation concealment (selection bias)	Unclear risk	Not reported.

Field 1997 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	High risk	Unable to blind.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Research assistant examined hospital records blind to group allocation.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No losses were reported.
Selective reporting (reporting bias)	Unclear risk	Trial protocol unavailable but comprehensive range of outcomes reported.
Other bias	Low risk	Appears to be free of other bias.

Ganji 2013a

Methods	RCT in 2 hospitals in Iran.
Participants	128 women (32 in each group) aged 18–35 years. Inclusion criteria: • nulliparous, • gestational age of 37–41 weeks, • single pregnancy, • cephalic presentation • cervix dilatation of 3–4 cm. Exclusion criteria: • women with psychiatric disorders, • contracted pelvic, • chronic systemic disorders, • dermatological problems in cold therapy region • complications of pregnancy such as gestational hypertension, decrease in fetal movement, fetus growth retardation, fetal death, abnormal fetal heart rate • application of other pharmacological or non-pharmacological analgesic methods.
Interventions	Experimental Group 1 (n = 32): cold pack (reported in Shirvani 2014). "In cold therapy group, a trained doula, who was a midwife, applied a 25 9 15 cm ice bag filled with 500 gr ice covered by a towel over back, abdomen and lower parts of the abdomen for 10 minutes since initiation of active phase and repeated 30 minutes later. Additionally, she applied a 15 x 10 cm cool pack filled with 200 gr ice over perineum during the second phase of delivery for 5 minutes every 15 minutes." Experimental Group 2 (n = 32): intermittent hot and cold packs (reported in Ganji 2013b). "During the first stage of delivery, participants of intervention group received warm water pack with a temperature of 38-40°C and covered with towel on their abdomen, lower abdomen, and low back for half an hour throughout contractions. Afterward, they received ice-pack covered with towel on the same parts of the body for 10 minutes. Then, heat was used once more after 30 minutes and this process was repeated. During the second stage of delivery, these times were decreased to half, so warm

Ganji 2013a *(Continued)*

	water pack covered with sterile towel was placed on patients' perineum for 15 minutes followed by ice pack for 5 minutes." Experimental group 3 (n = 32): heat packs only. "The heat therapy group received a warm water bag at a temperature of 38-40°C, covered with a towel on their abdomen, lower abdomen and lower back, intermittently based on mother preference, in the first stage, and also perineum in the second stage throughout contractions." Control group (n = 32) received only routine care.
Outcomes	Duration of labour, pain intensity assessed using VAS scale
Notes	Dates: September 2011–March 2012. Funding: Research Deputy of Mazandaran University of Medical Sciences (project no. H89-26). Conflicts of interest: the authors have no conflict of interests to disclose.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Random allocation sequence by numbered cards prepared by the head of research. In addition the groups were matched base on the rupture of membranes and BMI. For this purpose, randomisation was stratified according to these variables."
Allocation concealment (selection bias)	Unclear risk	Not described.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not possible to blind staff or women.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Unblinded caregiver collected data.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	It was not clear how many women were actually randomised or how many exclusions were postrandomisation. No loss to follow up was reported however denominators are not clear in results tables, and authors report that the results do not include operative births. It is not clear when these women are excluded.
Selective reporting (reporting bias)	Unclear risk	Protocol not seen. Results reported across 3 reports. Results not reported consistently for control or heat groups.
Other bias	High risk	Similar baseline characteristics. Reporting unclear in places. 3 reports of 1 trial, different exclusion criteria reported and it is not clear in each paper that results are reported for a subset of a larger trial. Different papers report different outcomes so outcome data are not available for all interventions.

Janssen 2008

Methods	77 women randomised.

Janssen 2008 *(Continued)*

	Setting: the trial took place at BC Women's Hospital in Vancouver, British Columbia, Canada. BC Women's is an academic teaching hospital. It provides primary care to women who are residents of the City of Vancouver, regional referral care to residents of the lower mainland or southwest corner of the province, and tertiary referral care for the entire province. Approximately 7500 take place at this hospital annually; about 7000 are to women who reside in Vancouver. All women for whom delivery is not imminent are triaged in a large assessment room adjacent to the delivery suite prior to being admitted for intrapartum care. Women in labour have 1-to-1 care in a private labour room. They may have whomever else they want in the room to support them.
Participants	Inclusion criteria • Nulliparous • Singleton gestation • Cephalic presentation • Term gestation (37-41 completed weeks of pregnancy) • Maternal age between 18 and 35 years of age • In spontaneous labour, defined for our purposes as painful contractions which have resulted in cervical change, i.e. cervix is 1 cm dilated or more with effacement at 25% (0.5 cm) or more on admission to the labour unit • Able to speak and read English Exclusion criteria • Pre-existing medical conditions including but not limited to: insulin dependent diabetes, renal, cardiac, or thyroid conditions, hypertension, epilepsy, psychosis, use of illicit drugs • Conditions arising during pregnancy which require non-routine surveillance and/or intervention including but not limited to gestational diabetes, gestational hypertension, 2nd or 3rd trimester haemorrhage, intrauterine growth restriction, presence of a fetal congenital anomaly, history of preterm pre-labour rupture of membranes • Statement by women on admission that she has been in labour for more than 24 hours • Cervical dilatation 10 cm (full dilatation) on admission to the labour ward
Interventions	Swedish massage administered for up to 5 hours by a registered massage therapist during labour.
Outcomes	Main outcome measures include: cervical dilation at the time of administration of epidural, compared using estimated marginal means in an analysis of covariance. Perception of pain at 3 time periods during labour according to cervical dilation at 3–4 cm, 5–7 cm, and 8–10 cm using the McGill Present Pain Intensity Scale a) the severity of pain from contractions; b) length of first and second stage of labour; c) need for use of entonox, intravenous or intramuscular narcotics, and epidural analgesia; d) cervical dilation at the time of epidural insertion among those women who receive epidural analgesia; and e) mode of delivery: spontaneous vaginal, assisted (vacuum/forceps), or caesarean section.
Notes	Dates of trial: not mentioned. Funding: funded by the Holistic Health Research Foundation of Canada, Massage Therapy Foundation, and Massage Therapists' Association of BC. Declaration of interest: none disclosed. "The funding agencies had no role in the design of the trial, in the collection, analysis and interpretation of the data, in the writing of the report or in the decision to submit the report for publication."

Risk of bias

Bias	Authors' judgement	Support for judgement

Janssen 2008 *(Continued)*

Random sequence generation (selection bias)	Low risk	Seqential numbers using random seed generated by PASW, version 18.
Allocation concealment (selection bias)	Low risk	Sealed sequentially numbered envelopes
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and personnel do not appear to have been blinded, but it is not clear if patients were aware that massage in 24 hour postpartum period was the control treatment.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcome assessment blinding was not mentioned but unlikely that care givers were unblinded to the intervention.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data.
Selective reporting (reporting bias)	Unclear risk	Protocol not available.
Other bias	Low risk	No baseline imbalances.

Karami 2007

Methods	Parallel RCT of massage compared with usual care.
Participants	60 pregnant women recruited from Hedayat and Mahdiyeh Hospitals, Tehran, Iran during 2004. Primiparous women aged 20-35 years, Inclusion criteria: • single live fetus • gestational age of 38 to 42 weeks, • cervical dilation at 4 cm.
Interventions	Massage group: massage therapy using effleurage technique during delivery. The massage was administered on sacrum, buttocks, shoulders, waist, foot and hand during different phases of labour. Control group: routine standard care.
Outcomes	Pain intensity using the VAS, some clinical outcomes.
Notes	Dates of trial: 2004. Funding: not mentioned. Declaration of interest: not mentioned.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random number tables.

Karami 2007 *(Continued)*

Allocation concealment (selection bias)	Low risk	Sealed envelopes.
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Staff were not blind to group allocation.
Incomplete outcome data (attrition bias) All outcomes	Low risk	None.
Selective reporting (reporting bias)	Unclear risk	No protocol available but report appears complete.
Other bias	Low risk	No differences in baseline characteristics.

Kimber 2008

Methods	RCT of massage plus relaxation, music plus relaxation and usual care.
Participants	90 women booked from Horton Maternity Unit, Banbury, UK. Inclusion criteria: • women booked for care and birth at the unit during the trial period. Exclusion criteria: • planned elective caesarean section, • multiple pregnancy, • existing medical problems that precluded the use of massage, • previous use of the massage programme or a strong preference for a particular form of pain relief. • women who did not speak fluent English • not intending to have a birth companion
Interventions	Massage programme with relaxation techniques. Participants attended a 2.5-hour class between 35 and 37 weeks' gestation with chosen birth companion. Massage techniques were taught by the midwife/therapist. Birth partner learnt to perform slow rhythmic long stroke massage movements using the flats of the hands. These strokes were combined with slow rhythmic breathing and performed primarily on the lower back and also the upper and lower limbs. The massaging hands move upwards during inspiration and downwards during expiration. The woman and her birth partner were taught to synchronise massage strokes with controlled breathing. The visualisation/mind mapping component was taught by asking the woman to visualise/focus on the massaging hands. Participants were asked to practise the programme at least 3 evenings a week, for about 30–45 minutes, until 39 weeks and then a combination of techniques every evening, until hospital admission for labour/induction. Able to attend the usual antenatal classes. Active control: relaxation techniques and music. The placebo class taught breathing and visualisation techniques, and music instead of massage. The woman and her birth partner were encouraged to practise a slow breathing rhythm and visualisation techniques. The woman and her birth partner chose their favourite music. Able to attend the usual antenatal classes (we disregarded this group in this review as it is included in another Cochrane review on relaxation).

Kimber 2008 *(Continued)*

	Control: given the option and encouraged to attend the usual antenatal preparation classes currently available at the trial site.
Outcomes	Self-reported labour pain: 2 separate VAS scales were used to record labour and birth pain(s), around 90 minutes following birth, before transfer from labour care. Secondary outcomes: use of pharmacological analgesia, obstetric interventions, birth outcomes and women's birth-related worries based on the Cambridge Birth Worry Scale, maternal satisfaction and sense of control (Labour Agentry Scale).
Notes	Recruitment between December 2004 and January 2006. Power analysis reported to detect a reduction in VAS scores from 8.5 to 7.5 (standard deviation 2), with 80% power and 5% significance. Dates of trial: not mentioned. Funding: complementary medicine grant from Oxfordshire Health Services Research Committee (OHSRC). Declaration of interest: not mentioned.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-based randomisation program using minimisation for parity.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not possible to blind participants or clinicians.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Midwives collecting the data were not blind to the interventions.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data were balanced between groups: Clinical details labour: 30/28/28, VAS 1: 29/28/28, VAS 2: 25/26/25. 2 withdrew from placebo group (1 after randomisation and 1 in labour).
Selective reporting (reporting bias)	Low risk	Protocol available, all outcomes of interest to this type of trial have been reported.
Other bias	Unclear risk	Unclear.

Levett 2016

Methods	RCT.
Participants	176 nulliparous women attending antenatal clinics in 2 hospitals in Australia. Inclusion criteria: • 24-34 weeks' gestation

Levett 2016 *(Continued)*

	• singleton low-risk pregnancy.
Interventions	2-day course involving visualisation, yoga, breathing techniques, massage, acupressure, and facilitated partner support. The detail provided in the methods section of the paper were reviewed by Therese Dowswell Research Associate at the Cochrane Pregnancy and Childbirth and Machiko Suganuma an **author of this review.** We considered the intervention was primarily a manual method and should be included in this systematic review.
Outcomes	Primary outcome: epidural use for pain relief. Secondary outcome: included normal vaginal birth rate, caesarean section rate, assisted vaginal birth, other pharmacological pain relief, induction or augmentation, perineal trauma, PPH, low Apgar scores at 5 minutes, admission to SCN/NICU, sense of control in labour (Labour Agentry Scale) and EPDS.
Notes	Dates of trial: April 2012 to August 2013. Funding: the researcher is funded by an Australian Postgraduate Award, and a Postgraduate stipend from the Western Sydney University (WSU). Additional support in the form of RTS funds was given from the National Institute of Complementary Medicine (NICM) at WSU. Declaration of interest: none declared.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Web based computer randomisation. Stratification for site. 1:1 allocation.
Allocation concealment (selection bias)	Low risk	Central randomisation via “sealed envelope” website and concealed centrally.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Women were aware of treatment allocation, but control group not aware of course content. Reported that staff providing care at the birth were not aware of treatment group, and were not aware of course content, but may have provided support with techniques if known.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Reported that data were extracted from notes and linked by ID codes so that analysis was undertaken blind.
Incomplete outcome data (attrition bias) All outcomes	Low risk	There was relatively little loss to follow up and an ITT analysis. There was some sample attrition for Labour Agentry Scale, but overall low for clinical outcomes.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported and ITT analysis power calculation based on primary outcome.
Other bias	Low risk	Groups appeared similar at baseline. It was not clear what proportion of women attending for care were eligible for inclusion in the trial. This may not be a source of bias but may affect the generalisability of results.

Mortazavi 2012

Methods	Quasi-randomised 3-arm trial.
Participants	120 multiparous women attending Baharlou university hospital in Tehran, Iran.

Mortazavi 2012 *(Continued)*

	Inclusion criteria: • spontaneous labour • experiencing a normal pregnancy without any complications, • term pregnancy at the time of admission (gestational age between 37 and 42 weeks) • cervical dilatation of no more than 4 cm.
Interventions	Massage group: firm and rhythmic massage was given to the massage group for 30 minutes in 3 phases: latent phase (3–4 cm cervical dilation), active phase (5–7 cm cervical dilation), and deceleration phase (8–10 cm cervical dilation). Before massage started, mothers were encouraged to close their eyes and breathe deeply to concentrate on the massage. Massages included shoulder and back massage, abdominal efflurage and sacral pressure. The type of massage was selected based on mothers' preference. Control groups: 1. attendant group and 2. control group (40 in each group). In the attendant group, the labouring woman's attendant accompanied her during the whole labour.
Outcomes	After 30-minute massage at each phase, 3 parameters of pain, anxiety and satisfaction levels were evaluated. Furthermore, satisfaction was measured 30 minutes after delivery. Self-reported present pain intensity (PPI) scale was used to measure the labour pain. PPI is a scale of 0–5 (0 represents no pain; 1 mild pain; 2 moderate pain; 3 distress; 4 severe pain; and 5 intolerable pain). Anxiety was measured with the standard VAS.
Notes	Data are reported narratively, for reasons given in the text of the review, but not included in meta-analysis. Dates of trial: November 2009 to April 2010. Funding: supported by Students' Scientific Research Center of Tehran University of Medical Sciences and health Services grant. Declaration of interest: none declared.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Samples of each group entered the trial on separate intermittent days of the week.
Allocation concealment (selection bias)	High risk	Randomised by day of the week.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not blinded.
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Unclear.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported.

Mortazavi 2012 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	Protocol not available.
Other bias	Unclear risk	Baseline characteristic similar. Little information in paper, author contacted.

Silva 2013

Methods	RCT.
Participants	46 primigravida, Inclusion criteria: a single fetus • cephalic position, • low-risk pregnancy, • at least 37 weeks of gestation, • spontaneous onset of labour, • cervical dilation of 4–5 cm with appropriate uterine dynamics for this phase, • no use of medication from admission to hospital until randomisation, • absence of cognitive or psychiatric problems, • intact ovular membranes, • appropriate literacy skills, • no associated risk factors. Trial took place in hospital setting in Brazil.
Interventions	The experimental group received massage from a physiotherapist (the primary researcher) at the beginning of the active phase of labour, during the period of 4–5 cm of cervical dilation and during uterine contractions for 30 minutes. The intensity of the massage was determined by the participant, who was instructed to request greater or lesser force during execution of the massage according to her preference. The technique was applied between T10 and S4, which corresponds to the path of the hypogastric plexus and the pudendal nerve, responsible for innervation of the paravertebral ganglia, delivery canal, and perineum. The massage consisted of rhythmic, ascending, kneading hand movements and a return with sliding through the lateral region of the trunk in association with sacral pressure. The participants were also instructed to choose their preferred position for receiving massage, i.e., sitting, lateral decubitus, or standing with the trunk bending forward. This group also received other routine maternity ward care. The control group received the same routine maternity ward care. In addition, the same primary researcher accompanied participants in the control group for 30 minutes during the period of 4–5 cm of cervical dilation, as done for the massage group, although the investigator was there merely for observation and to answer questions.
Outcomes	Outcome measures: the primary outcome was pain severity measured on a 100 mm VAS before and after intervention. Secondary outcomes included the Short Form McGill Pain Questionnaire, pain location, and time to analgesic medication use. After labour, a blinded researcher also recorded duration of labour, route of delivery, neonatal outcomes, and the participant's satisfaction with the physiotherapist during labour.
Notes	Dates of trial: September 2009 to May 2010. Funding: CNPQ, who provided the master's degree scholarship and aided in the development of this trial.

Silva 2013 *(Continued)*

Declaration of interest: not mentioned.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	After meeting the eligibility criteria for the trial, participants were randomly allocated by the primary researcher to an experimental group or a control group according to a computer-generated random allocation list.
Allocation concealment (selection bias)	Low risk	Computer-generated random allocation.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and investigator were not blinded.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Outcome assessor was blinded to group allocation.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Outcome data were collected on all participants.
Selective reporting (reporting bias)	Unclear risk	Protocol not available.
Other bias	Low risk	Nil known, no baseline imbalances.

Taavoni 2013

Methods	Described as randomised control trial.
Participants	60 volunteer primiparous women recruited from public hospital (Lolagar Hospital) of Iran University of Medical Sciences, Tehran, Iran. Participants were 18- to 35-year-old primiparous women. Inclusion criteria: • 1 pregnancy, • cephalic presentation, • 38–40 weeks of gestation, • anticipating a normal birth, • not having performed perineal massage.
Interventions	Experimental intervention: the investigator applied warm packs to the participants' sacral and perineal area. A warm, moist towel soaked in boiled tap water at a temperature of roughly 45°C was used as a warm pack. Subjects were asked to hold and fix the pack with their closed thighs for at least 30 minutes. The subjects were asked to check the towel's heat by their hands to avoid burning or discomfort. Control group experienced usual care in a reclining position without ambulating or any other intervention.
Outcomes	Pain scores were recorded by the investigator every 30 minutes until the dilation has reached 8 cm. 0-10 VAS.

Taavoni 2013 *(Continued)*

	Satisfaction measured along 0-10 VAS. Other maternal outcomes recorded.
Notes	Quasi-randomisation, perineal warm pack. Dates of trial: 2009. Funding: "This trial was granted by the Research Department of Tehran University of Medical Sciences, year 2009 (Thesis of S. Abdolahian: Code No: 771 P)". Declaration of interest: none declared.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported.
Allocation concealment (selection bias)	Unclear risk	Not reported.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Both groups and clinicians would be aware of group status.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Investigator applied pack and recorded data.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	2 participants from the heat therapy group and 1 from the control group were excluded because they needed a caesarean section caused by the lack of descent.
Selective reporting (reporting bias)	High risk	No protocol, no denominators.
Other bias	Unclear risk	Unclear due to insufficient information.

Taghinejad 2010

Methods	Parallel design RCT of massage versus active control of music.
Participants	101 women recruited from Mustafa Hospital in the Ilam Province of Western Iran. Inclusion criteria: • primiparous, • singleton pregnancy, • 20-30 years old, • dilation < 4 cm, • 37-42 weeks' gestation, • cephalic presentation, • normal birthweight. Exclusion criteria:

Taghinejad 2010 *(Continued)*

- women receiving analgesic or antipsychotic medications,
- induced labour
- SROM greater than 20 hours,
- mothers with hearing and visual difficulties,
- infectious diseases,
- inflammation and dermal sensitivities in the massage fields.

Interventions	Massage: at up to 3-4 cm dilation, women in the massage therapy group were requested to close their eyes and take rhythmic breaths deeply. During contractions, they were asked to take breaths more deeply and calmly by concentrating on the massage. Massage points were the lower area of the abdomen, shoulders, back and pressed pubic area. All received 30 minutes of massage. Active control (music): women were requested to listen to soft traditional music without lyrics (1 of 5 optional types) using head-phones for 30 minutes, starting early in the active phase of labour.
Outcomes	Pain intensity using VAS before and after intervention, duration of latent phase or labour, expression of need for some other pain relief. VAS presented as categorical 6-point scale (6 = severe, 5 = very severe, 4 = less severe, 3 = moderate, 2 = mild, 1 = painless).
Notes	101 pregnant women. Dates of trial: 2007. Funding: not mentioned. Declaration of interest: "The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript".

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computerised minimisation program to assign participants to massage or music groups.
Allocation concealment (selection bias)	Unclear risk	Not described.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants not blind, caregivers unclear.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	VAS was administered by research colleagues who were not aware of the assignment of participants.
Incomplete outcome data (attrition bias) All outcomes	Low risk	None.
Selective reporting (reporting bias)	Unclear risk	There are no suggestions of selected reporting bias, protocol unavailable.
Other bias	Low risk	None.

CNPQ: funding body - but unable to clarify details of the funder

EPDS: Edinburgh postnatal depression scale
ITT: intention to treat
NICU: neonatal intensive care unit
NST: fetal non stress test
PPH: postpartum haemorrhage
RCT: randomised controlled trial
SCN: special care nursery
SROM: spontaneous rupture of membranes
VAS: visual analogue scale

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Akbarzadeh 2014	This trial is included in the systematic review of acupressure for pain management.
Bastani 2016	This trial is included in the systematic review of acupressure for pain management.
Dehcheshmeh 2015	The methods used in this trial were not clear. Author correspondence reports that allocation to groups was matched.
Fili 2017	This trial is to be included in the systematic review of aromatherapy review for pain management.
Hajiamini 2012	It was not clear that this was a randomised trial and there are methodological reasons for exclusion. Described as a quasi-experimental trial with women allocated to 3 groups. There are no group denominators; 30% of the women were excluded due to women receiving pain mediation, augmentation, or women who did not want to continue "at any stage". It was not clear how many women were lost for any particular group or the reasons. Author contacted 20th June 2017 for clarification but there was no response.
Mafetoni 2015	This trial is included in the systematic review of acupressure for pain management.
Nourbakhsh 2012	This trial is to be included in the systematic review of aromatherapy review for pain management.
Ozgoli 2016	This trial is included in the systematic review of acupressure for pain management.
Torkzahrani 2017	This trial is included in the systematic review of acupressure for pain management.
Valiani 2010	This reports being a trial but there were large numbers of postrandomisation exclusions in the control group (and exclusions replaced) but not in the intervention group. Reflexology with a saline infusion was compared with routine care with a saline infusion plus oxytocin. This is not a valid comparison for the trial design to examine pain management in labour.
Yildirim 2004	This trial is included in the systematic review of relaxation for pain management; the intervention is of relaxation.

Characteristics of studies awaiting assessment *[ordered by study ID]*

Askari 2016

Methods	Not clear. May not be a RCT. Described as experimental clinical trial 120 women were "placed" in 3 equal sized groups.
Participants	Primiparous women in labour attending the trial hospital.
Interventions	Massage with sesame oil, versus other oil (placebo) versus routine care.

Askari 2016 *(Continued)*

Outcomes	Results reported as P values only. No raw data.
Notes	Awaiting further publications to clarify that this is a trial. We were unable to obtain author contact detail.

Azima 2012

Methods	Described as a clinical interventional trial. Women were randomly divided into 3 equal sized groups.
Participants	Women in labour.
Interventions	Stroking massage versus vibration massage (no details for either) intervention compared with no massage.
Outcomes	Pain was reported as P values only.
Notes	This trial was reported in brief abstracts. It was not clear that this was a trial. We contacted the author on 20 June 2017; no response has been received yet.

Can 2015

Methods	Described as a "randomized controlled trial" although there were no details on group allocation. 3 equal sized groups of 50. Under limitations it says 225 women were contacted but data evaluated from 150.
Participants	Women in labour; no further details.
Interventions	Ice massage on a pressure point on the large intestine compared with silicon filled balloon on same pressure point or no intervention.
Outcomes	Postaprtum pain.
Notes	We contacted the author on 20 June 2017 for more information about methods and results. We would like to clarify whether this intervention was intended to relieve pain in labour.

Dolatian 2011

Methods	Described as a randomised clinical trial but states that random allocation software was used (not clear if this was for sequence generation) but there was also a mention of "Sampling days were randomly selected for each group". There was no information on group denominators so we are not able to include data unless we hear from the author (author contacted for clarification 20 June 2017).
Participants	Low-risk women with no medical complications in labour.
Interventions	A placebo type support/talking intervention versus routine care.
Outcomes	Pain reported on a graph (no group denominators and no standard deviations.
Notes	Awaiting clarification about methods and results from the author.

Dolatian 2011 *(Continued)*

	We contacted the author on 20 June 2017.

Faezah 2010

Methods	2-arm parallel RCT.
Participants	120 primiparous women at term.
Interventions	30 minutes of massage involving firm and rhythmic strokes during the 3 phases of labour compared to control.
Outcomes	Anxiety, satisfaction.
Notes	

Hanjani 2013

Methods	Reports "continuous randomized in two [equal sized] groups and this continued until the required samples were achieved". It was reported that women who were unwilling to continue were later excluded. It was not clear what outcome was used for the power calculation. We contacted the author on 20 June 2017 for clarification.
Participants	Primigravida with singleton pregnancy in active labour who did not use any anaesthesia method or induction of labour.
Interventions	Foot massage in particular areas of the foot compared with massage to other areas of the foot.
Outcomes	Pain and duration of labour.
Notes	We were not able to assess eligibility from the information in the trial reports. We have contacted the authors for clarification of methods and results.

Haseli 2014

Methods	Described as a randomised controlled trial.
Participants	Primiparous women (n = 64) in labour with single fetus aged 15-35 years, with a cervical dilation of 4 cm, and a gestational age of 37-42 weeks of pregnancy.
Interventions	Experimental group received effleurage abdominal massage plus Lamaz breathing techniques during the first thirty minutes of active (4 cm) and transitional (8 cm) phase of labour. The control group did not receive the intervention.
Outcomes	Satisfaction was measured by Mackey Childbirth Satisfaction Questionnaire.
Notes	Information from conference abstract only. No published paper or protocol is available.

Jenabi 2012

Methods	Described as a randomised clinical trial.
Participants	Nulliparous women in labour.
Interventions	Not clear; mentions reflexology, but later refers to "massage of the uterus pain" for 30 minutes compared with massage to another area for 30 minutes.
Outcomes	Reports measuring pain but no data reported in this abstract.
Notes	The original article is not in English and we have requested a translation. We contacted the author on 21 June 2017 for more information. No response.

Kuo 2014

Methods	Allocated by "randomization". No other details, equal sized groups.
Participants	Women in the latent phase of labour.
Interventions	Homemade pebble bag of hot compress, not clear where applied. The comparison group was not described.
Outcomes	There were no data reported in this brief conference abstract.
Notes	We are attempting to contact the author and to obtain a copy of the MSc thesis reported in the abstract. Awaiting further information and translation.

Mirzaee 2010

Methods	Women "were randomly allocated to two equal"; no other information.
Participants	70 nulliparous women (not clear when recruited or when the intervention was carried out).
Interventions	Reflexology on feet versus massage to legs.
Outcomes	Anxiety.
Notes	There was too little information in the brief English abstract to determine eligibility. We are attempting to contact the authors for more information and to obtain a translation of the full paper.

Mohammadkhani 2012

Methods	Described as "single-blind randomized clinical trial". No information on methods, denominators or results.
Participants	90 women admitted to hospital in labour.
Interventions	Massage alone (no details) versus massage with almond oil versus massage with lavender oil (called aromatherapy massage).

Mohammadkhani 2012 *(Continued)*

Outcomes	Report reduction in pain intensity but results as P values, no raw data reported.
Notes	Methods not clear, no data we can use. We contacted the author on 22 June. This trial may be eligible for inclusion in a related Cochrane Review.

Sereshti 2013

Methods	Described as a clinical trial and refers to randomly allocated (not clear how many allocated to each group).
Participants	120 women in labour.
Interventions	Massage compared with intravenous pethidine or standard care.
Outcomes	Not clear.
Notes	The original paper is not in English. We are attempting to obtain a translation. We were not able to assess Eligibility from this brief abstract.

Shafai 2013

Methods	Described as single-blind clinical trial.
Participants	370 nulliparous mother in Talesh Shahid Nooraani Hospital.
Interventions	The trial compared physiological and traditional delivery. The intervention included aromatherapy, pelvic exercises with ball, back and stomach massage during contractions using Lavandula oil, and an accompanying person in active phase of labour.
Outcomes	Maternal outcomes not specified. Abstract states that data are profile of subjects and assessment of first, second, third and fourth stages of delivery and also 10 days after delivery.
Notes	Abstract from journal article only available in English. Awaiting translation.

Zhang 2000

Methods	Control trial.
Participants	88 women.
Interventions	Point therapy for labour pain, injecting into bilateral points Hegu. Intervention 1: saline group. Intervention 2: lidocaine group. Intervention 3: dolantin group. Control group.
Outcomes	Neonatal umbilical vein.

Zhang 2000 *(Continued)*

Notes	No details available, awaiting translation.

RCT: randomised controlled trial

Characteristics of ongoing studies *[ordered by study ID]*

Quintana 2011

Trial name or title	Assessment of the effects of massage pain relief in nulliparous women during the active phase of labour.
Methods	Single-blind randomised controlled trial.
Participants	Inclusion criteria • Nulliparous • Literate • A single fetus in vertex position • Low-risk pregnancy • From 37 weeks of gestation • Cervical dilatation from 4 cm with normal uterine dynamics in this phase • Labour in early spontaneous • No use of medications during the trial period • Absence of cognitive or psychiatric problems • Intact membranes • No risk factors associated • You want to participate and signing the informed consent Exclusion criteria • Use of drugs or any procedure that aims to relieve pain • Intolerance to the application of massage therapy • Presence of dermatological conditions that indicate against the application of massage therapy
Interventions	Massage Group (GM): receive lumbosacral massage for 30 minutes, during uterine contractions between 4-5 cm of cervical dilation versus usual care.
Outcomes	Pain relief in labour, length of labour, augmentation, mode of delivery, maternal satisfaction.
Starting date	September 2009.
Contact information	Silvana Maria Quintana, Associate Professor, University of Sao Paulo, Brazil.
Notes	Unclear status reports results are reported in Chang 2002 paper

Quintana 2012

Trial name or title	Application of non-pharmacological resources in assisting labour: randomised controlled trial.
Methods	Parallel randomised controlled trial, single-blind.
Participants	60 low-risk primigravidae women in labour. Inclusion criteria

Quintana 2012 *(Continued)*

	• Agreed to participate in the trial after reading and signing the consent form • Primigravida • Pregnancy only • Gestational age ≥ 37 weeks • Presentation fetal head • Chorioamniotic intact membranes • Working with spontaneous onset of labour • Admission at the beginning of active phase dilation (4-5 cm) • Lack of maternal and fetal pathologies • Literacy — primary education • Absence of cognitive problems Exclusion criteria • Pregnant women admitted for induction of labour • Rupture premature or early of chorioamniotic membranes • Use of uterotonic drugs before the active phase
Interventions	Non pharmacological resources application protocol using the combination of non-pharmacological resources: standing upright pelvic mobility in the ball, alternating stance associated with lumbosacral massage and shower versus usual care.
Outcomes	Pain, experience and satisfaction.
Starting date	Oct 2011.
Contact information	Principal Investigator: Silvana M Quintana, professor, Faculty of Medicine of São Paulo University.
Notes	Recruitment status unknown, no update of information in more than 2 years.

Ying 2009

Trial name or title	Effectiveness of a program of massage, controlled breathing and visualization used in Chinese primigravida during intrapartum pain relief management from 36 weeks' gestation: a randomised control trial.
Methods	Randomised controlled trial.
Participants	Inclusion criteria: adult Chinese low-risk primiparous women who can understand and communicate with Cantonese and written Chinese, singleton with no known contraindication to vaginal delivery. Exclusion criteria: single mother with no partner available to learn massage technique, mentally unfit to participate and allergic to massage oil, with multiple pregnancy, placenta praevia, preeclampsia or other serious antenatal complications.
Interventions	Massage, controlled breathing and visualization. Childbirth massage at least once per week after 36 weeks' gestation. Control: standard antenatal and intrapartum care as usual.
Outcomes	Use of parenteral intramuscular pain relief, time of spontaneous labour onset, augmentation or induction of labour, birth and neonatal outcome, pain intensity, satisfaction to service/satisfaction to childbirth massage

Ying 2009 *(Continued)*

Starting date	2 September 2016
Contact information	Lai Chit Ying: cylai@cuhk.edu.hk
Notes	Chinese Clinical Trial Register ChiCTR-INR-16009158.

DATA AND ANALYSES

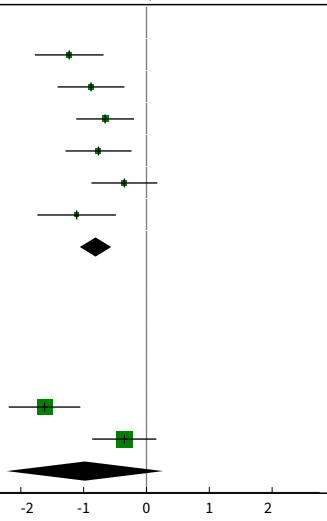
Comparison 1. Massage versus usual care

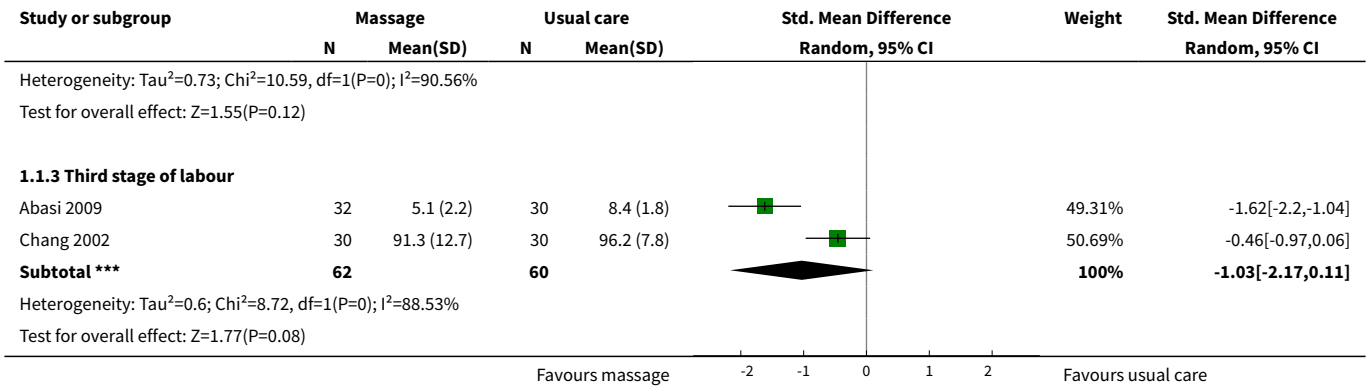
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain intensity	6		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 First stage of labour	6	362	Std. Mean Difference (IV, Random, 95% CI)	-0.81 [-1.06, -0.56]
1.2 Second stage of labour	2	124	Std. Mean Difference (IV, Random, 95% CI)	-0.98 [-2.23, 0.26]
1.3 Third stage of labour	2	122	Std. Mean Difference (IV, Random, 95% CI)	-1.03 [-2.17, 0.11]
2 Sense of control in labour	1	124	Mean Difference (IV, Fixed, 95% CI)	14.05 [3.77, 24.33]
3 Sense of control in labour (shortened Labour Agentry Scale)	1	56	Mean Difference (IV, Fixed, 95% CI)	-6.10 [-11.68, -0.52]
4 Satisfaction with childbirth experience	1	60	Mean Difference (IV, Random, 95% CI)	0.47 [-0.13, 1.07]
5 Satisfaction with childbirth experience	1	60	Risk Ratio (M-H, Fixed, 95% CI)	1.9 [1.07, 3.38]
6 Assisted vaginal birth	4	368	Risk Ratio (M-H, Fixed, 95% CI)	0.71 [0.44, 1.13]
7 Caesarean section	6	514	Risk Ratio (M-H, Fixed, 95% CI)	0.75 [0.51, 1.09]
8 Admission to neonatal intensive care unit	2	231	Risk Ratio (M-H, Fixed, 95% CI)	0.71 [0.31, 1.62]
9 Apgar score < 7 at 5 mins	2	215	Risk Ratio (M-H, Fixed, 95% CI)	0.72 [0.17, 3.14]
10 Use of pharmacological pain relief	4	368	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.37, 1.74]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
11 Length of labour (minutes)	6	514	Mean Difference (IV, Random, 95% CI)	20.64 [-58.24, 99.52]
12 Need for augmentation with oxytocin	5	468	Risk Ratio (M-H, Random, 95% CI)	0.77 [0.46, 1.29]
13 Perineal trauma	1	128	Risk Ratio (M-H, Fixed, 95% CI)	0.88 [0.79, 0.98]
14 Postpartum haemorrhage	1	171	Risk Ratio (M-H, Fixed, 95% CI)	0.82 [0.41, 1.61]
15 Women's emotional experience of the intervention (reduced anxiety) in labour	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
15.1 Anxiety first stage	1	60	Mean Difference (IV, Fixed, 95% CI)	-16.27 [-27.03, -5.51]
15.2 Anxiety second stage	1	60	Mean Difference (IV, Fixed, 95% CI)	-8.97 [-20.79, 2.85]
15.3 Anxiety third stage	1	60	Mean Difference (IV, Fixed, 95% CI)	-4.57 [-14.04, 4.90]
16 Spontaneous vaginal birth (not pre-specified)	4	408	Risk Ratio (M-H, Random, 95% CI)	1.12 [0.87, 1.44]
17 Resuscitation of newborn (not pre-specified)	2	231	Risk Ratio (M-H, Fixed, 95% CI)	0.43 [0.23, 0.79]

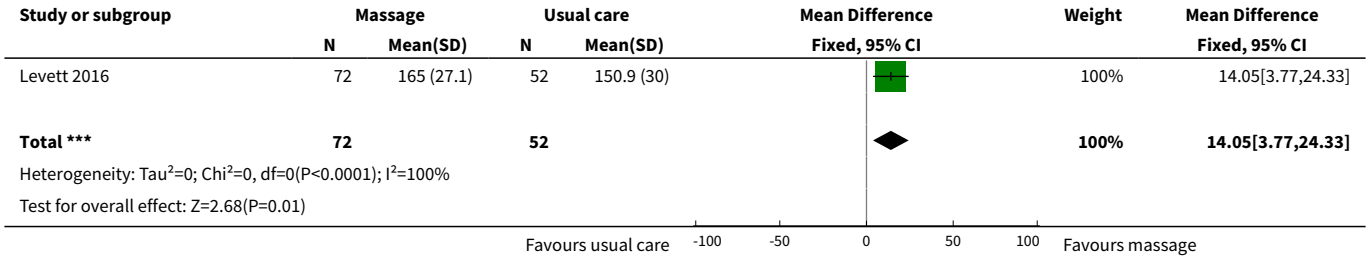
Analysis 1.1. Comparison 1 Massage versus usual care, Outcome 1 Pain intensity.

Study or subgroup	Massage N	Massage Mean(SD)	Usual care N	Usual care Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.1.1 First stage of labour							
Abasi 2009	32	2.8 (1.6)	30	4.9 (1.8)		15.97%	-1.23[-1.78,-0.68]
Chang 2002	30	43.1 (16)	30	57 (15.1)		16.62%	-0.88[-1.41,-0.35]
Janssen 2008	37	19.4 (16)	40	28.3 (10.4)		20.55%	-0.66[-1.12,-0.2]
Karami 2007	30	7.2 (0.8)	30	7.9 (1)		16.93%	-0.76[-1.29,-0.24]
Kimber 2008	28	68.9 (18.7)	29	75.2 (16.6)		17.02%	-0.35[-0.88,0.17]
Silva 2013	23	52 (20)	23	72 (15)		12.91%	-1.11[-1.74,-0.49]
Subtotal ***	**180**		**182**			**100%**	**-0.81[-1.06,-0.56]**
Heterogeneity: Tau^2=0.02; Chi^2=6.63, df=5(P=0.25); I^2=24.56%							
Test for overall effect: Z=6.37(P<0.0001)							
1.1.2 Second stage of labour							
Abasi 2009	32	3.6 (1)	32	6.5 (2.3)		49.48%	-1.62[-2.19,-1.05]
Chang 2002	30	76 (16.8)	30	82.4 (19.1)		50.52%	-0.35[-0.86,0.16]
Subtotal ***	**62**		**62**			**100%**	**-0.98[-2.23,0.26]**

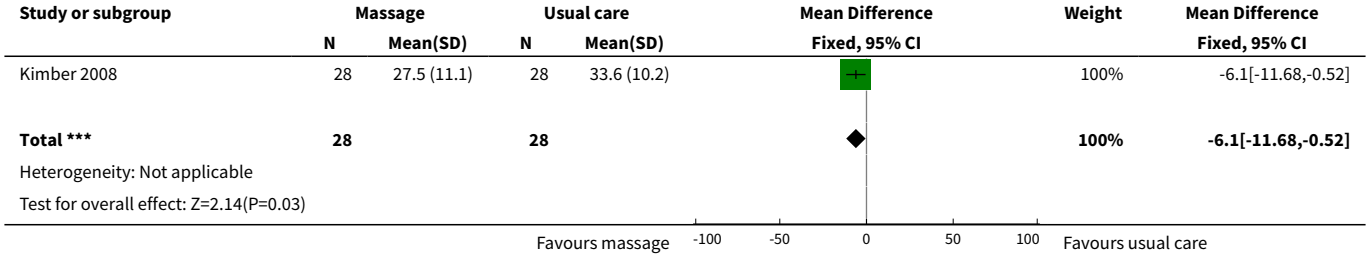




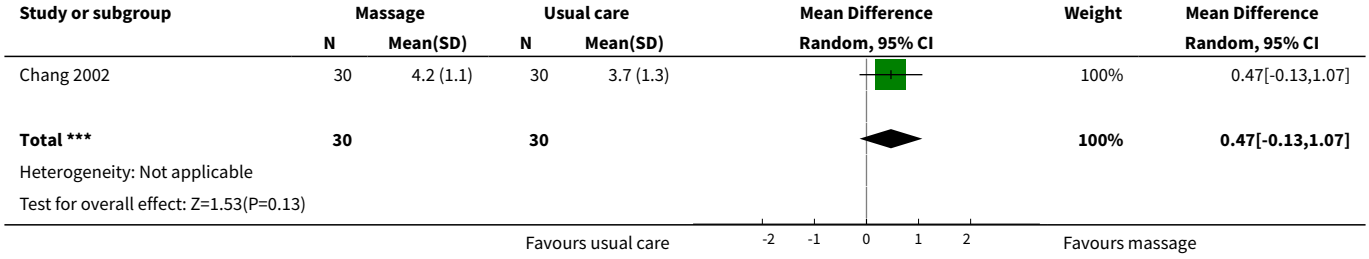
Analysis 1.2. Comparison 1 Massage versus usual care, Outcome 2 Sense of control in labour.



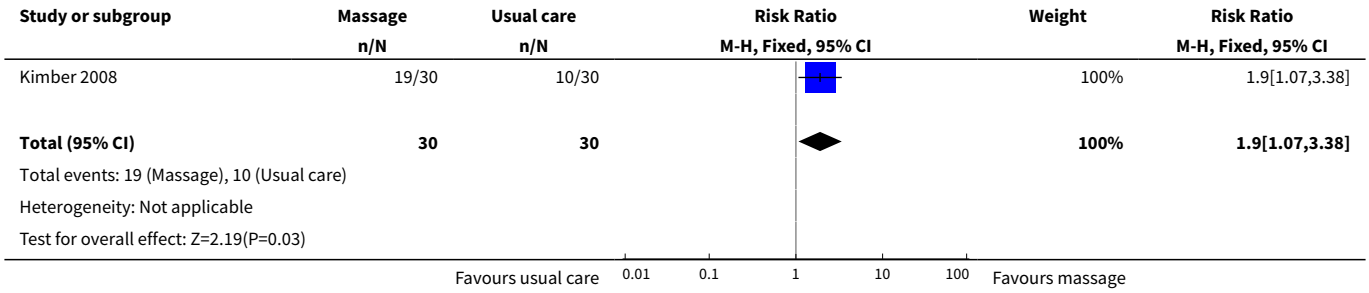
Analysis 1.3. Comparison 1 Massage versus usual care, Outcome 3 Sense of control in labour (shortened Labour Agentry Scale).



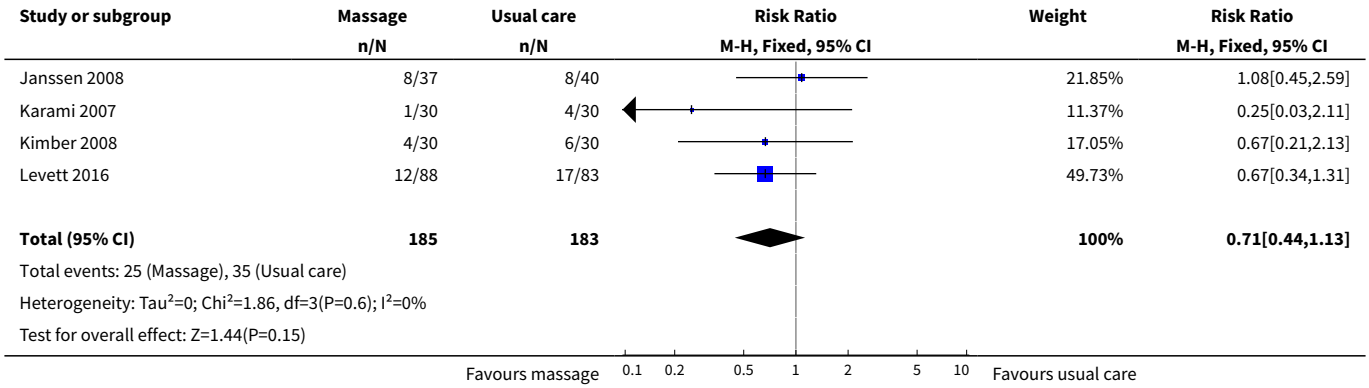
Analysis 1.4. Comparison 1 Massage versus usual care, Outcome 4 Satisfaction with childbirth experience.



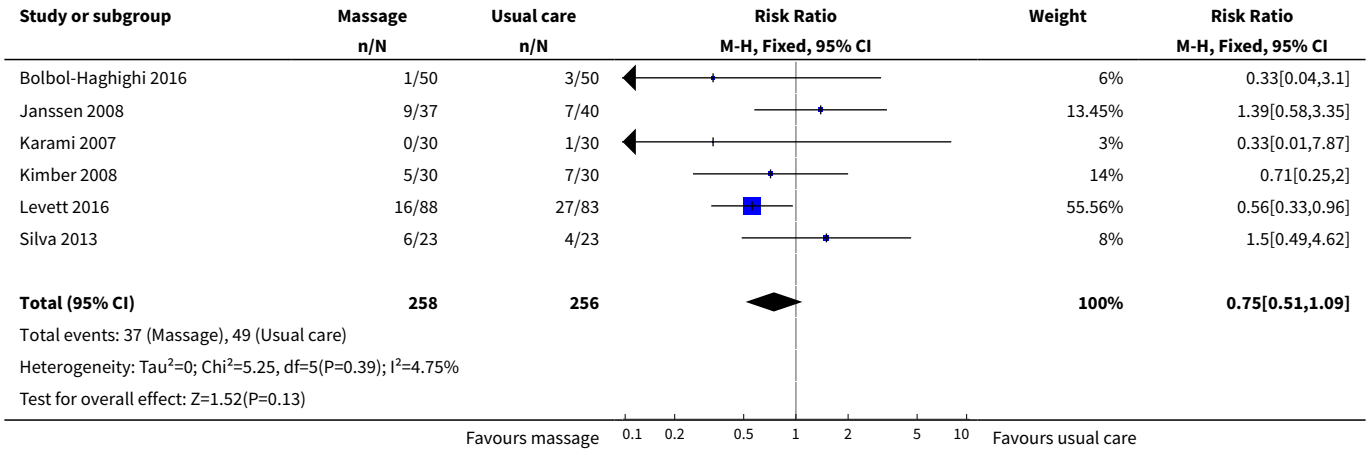
Analysis 1.5. Comparison 1 Massage versus usual care, Outcome 5 Satisfaction with childbirth experience.



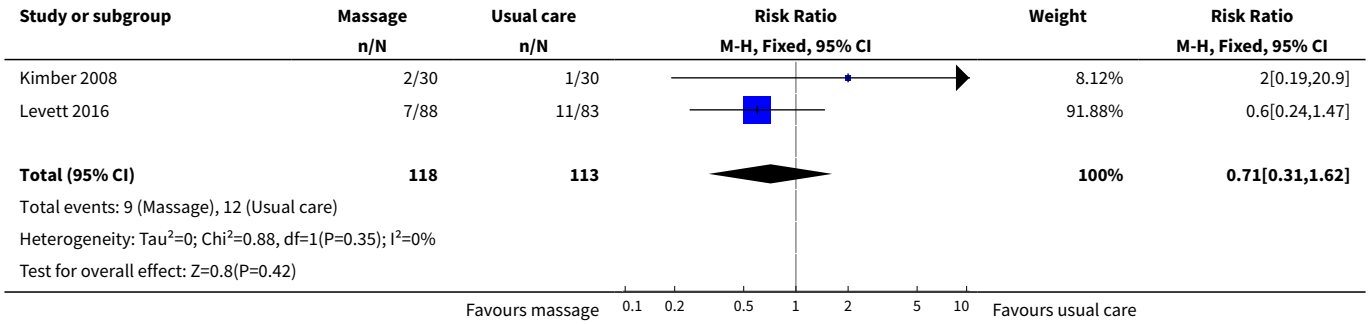
Analysis 1.6. Comparison 1 Massage versus usual care, Outcome 6 Assisted vaginal birth.



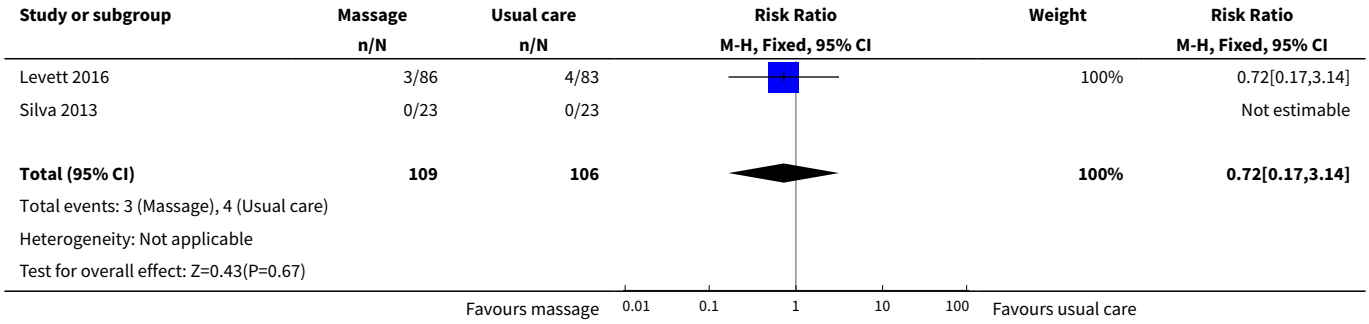
Analysis 1.7. Comparison 1 Massage versus usual care, Outcome 7 Caesarean section.



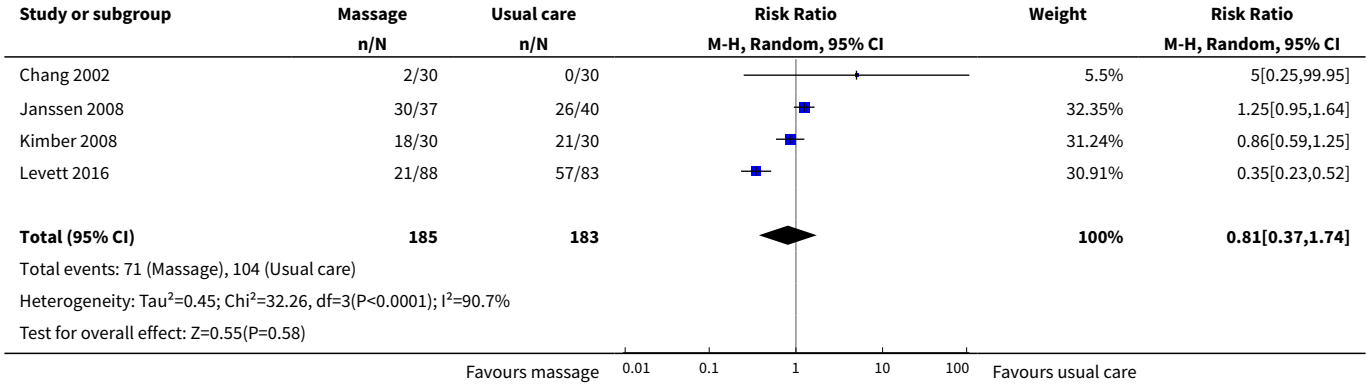
Analysis 1.8. Comparison 1 Massage versus usual care, Outcome 8 Admission to neonatal intensive care unit.



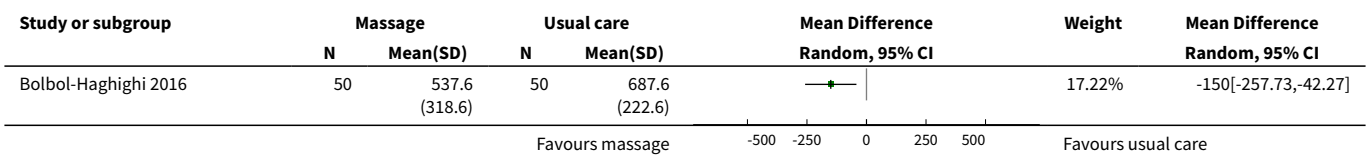
Analysis 1.9. Comparison 1 Massage versus usual care, Outcome 9 Apgar score < 7 at 5 mins.

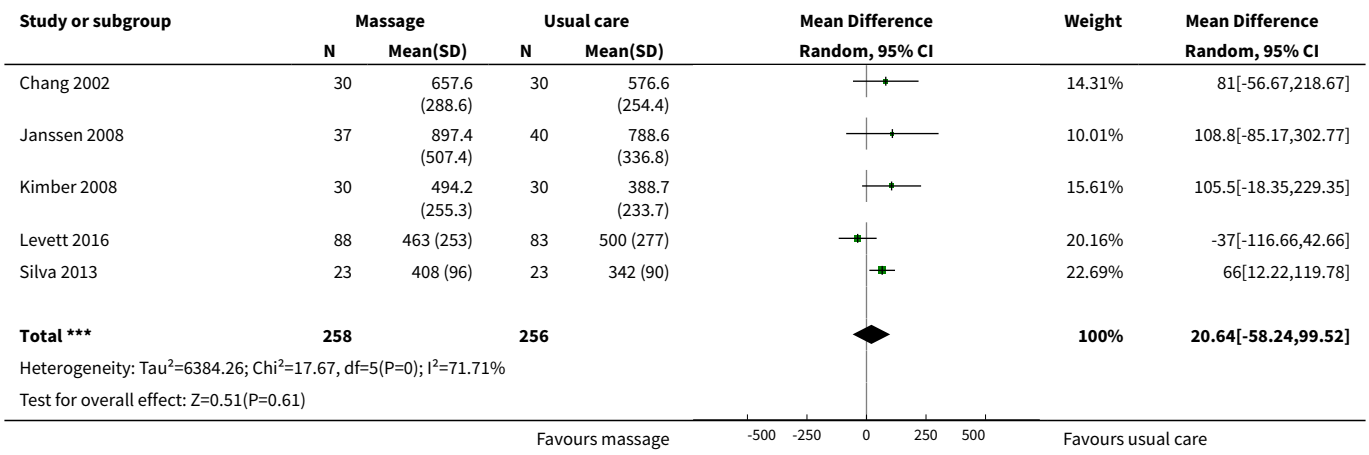


Analysis 1.10. Comparison 1 Massage versus usual care, Outcome 10 Use of pharmacological pain relief.

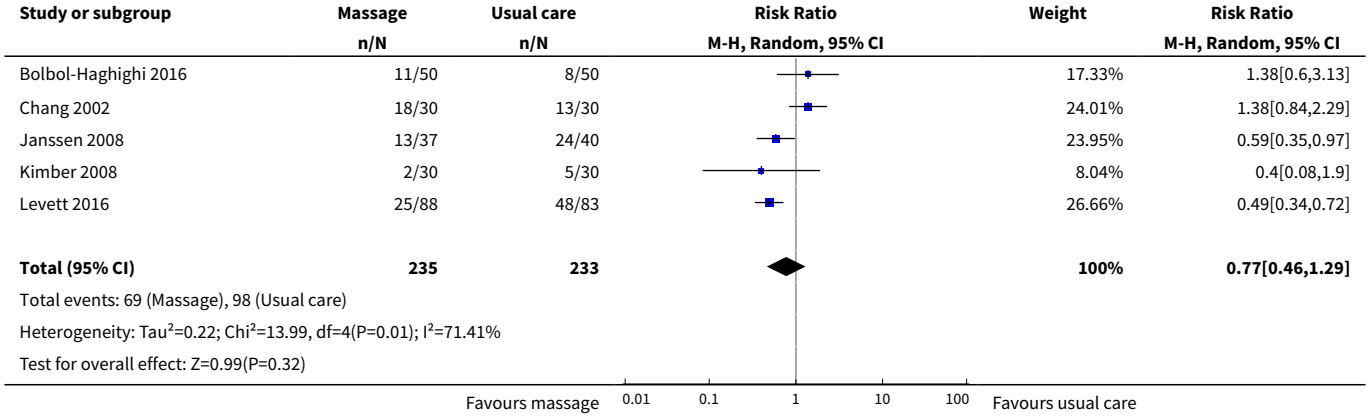


Analysis 1.11. Comparison 1 Massage versus usual care, Outcome 11 Length of labour (minutes).

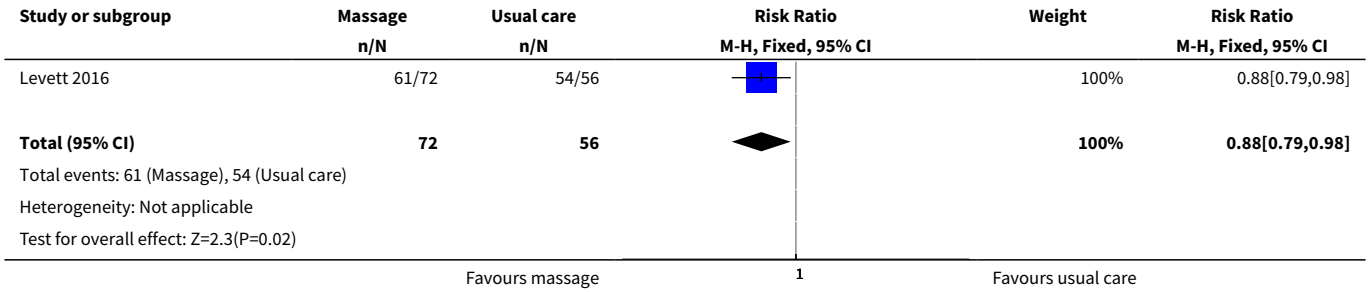




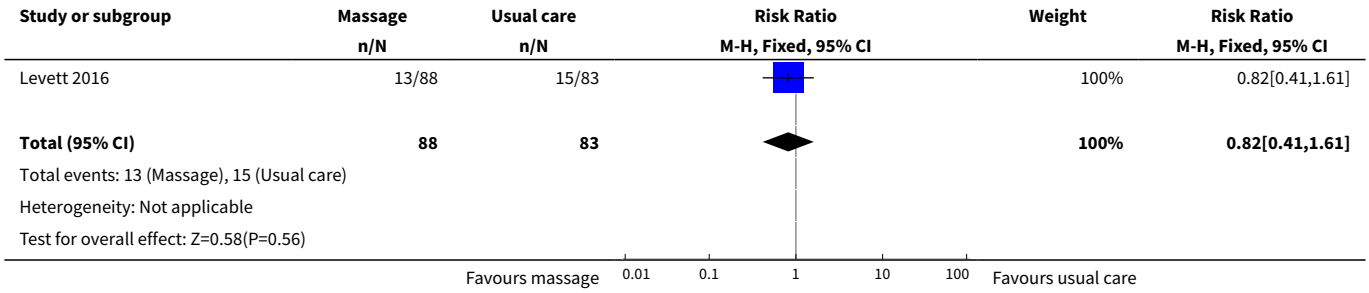
Analysis 1.12. Comparison 1 Massage versus usual care, Outcome 12 Need for augmentation with oxytocin.



Analysis 1.13. Comparison 1 Massage versus usual care, Outcome 13 Perineal trauma.

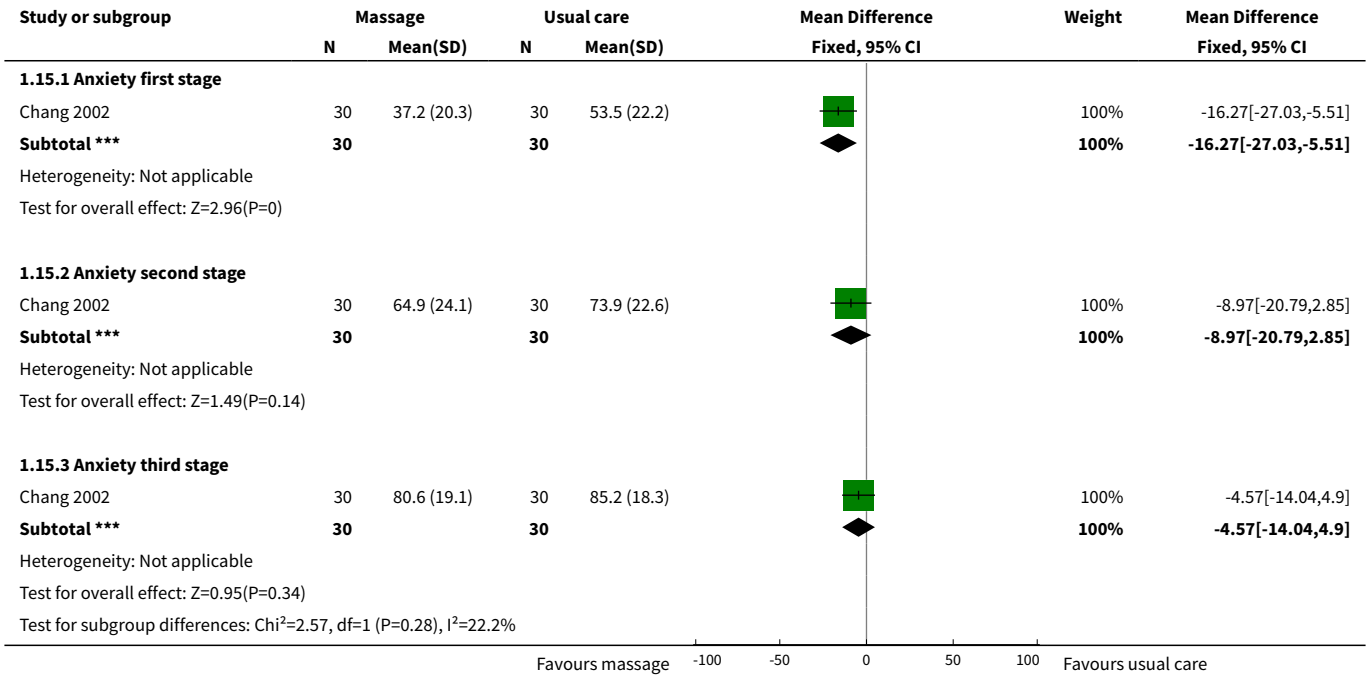


Analysis 1.14. Comparison 1 Massage versus usual care, Outcome 14 Postpartum haemorrhage.



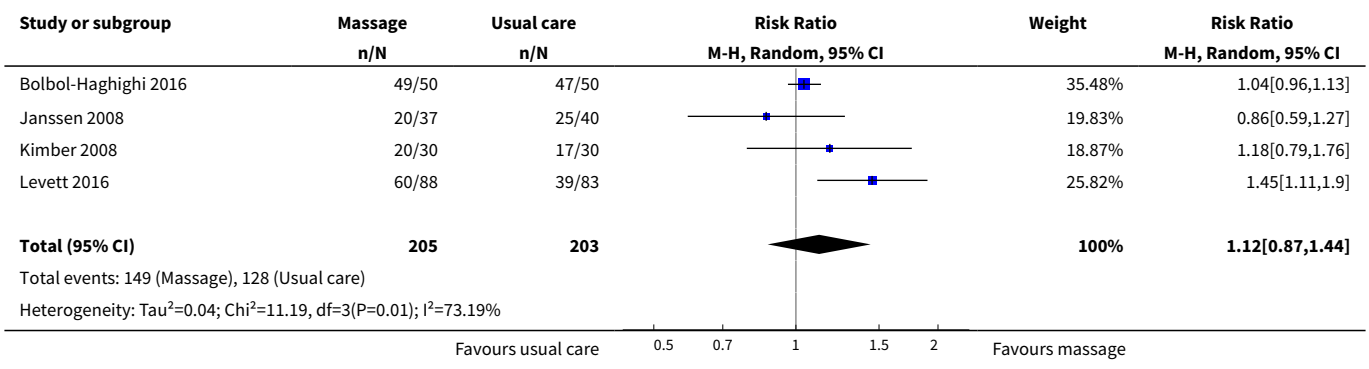
Study or subgroup	Massage n/N	Usual care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Levett 2016	13/88	15/83		100%	0.82[0.41,1.61]
Total (95% CI)	**88**	**83**		**100%**	**0.82[0.41,1.61]**
Total events: 13 (Massage), 15 (Usual care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.58(P=0.56)					

Analysis 1.15. Comparison 1 Massage versus usual care, Outcome 15 Women's emotional experience of the intervention (reduced anxiety) in labour.

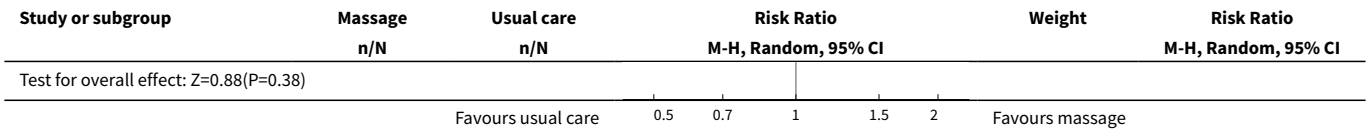


Study or subgroup	Massage N	Massage Mean(SD)	Usual care N	Usual care Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
1.15.1 Anxiety first stage							
Chang 2002	30	37.2 (20.3)	30	53.5 (22.2)		100%	-16.27[-27.03,-5.51]
Subtotal ***	**30**		**30**			**100%**	**-16.27[-27.03,-5.51]**
Heterogeneity: Not applicable							
Test for overall effect: Z=2.96(P=0)							
1.15.2 Anxiety second stage							
Chang 2002	30	64.9 (24.1)	30	73.9 (22.6)		100%	-8.97[-20.79,2.85]
Subtotal ***	**30**		**30**			**100%**	**-8.97[-20.79,2.85]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.49(P=0.14)							
1.15.3 Anxiety third stage							
Chang 2002	30	80.6 (19.1)	30	85.2 (18.3)		100%	-4.57[-14.04,4.9]
Subtotal ***	**30**		**30**			**100%**	**-4.57[-14.04,4.9]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.95(P=0.34)							
Test for subgroup differences: Chi^2=2.57, df=1 (P=0.28), I^2=22.2%							

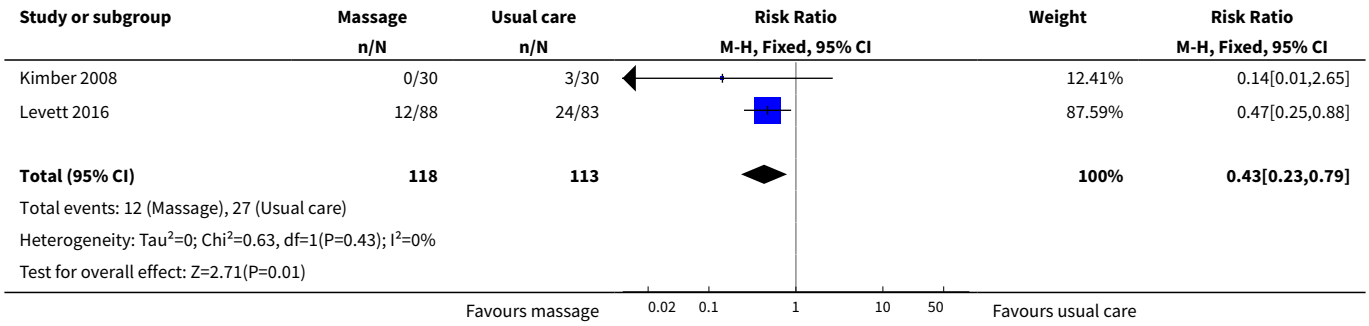
Analysis 1.16. Comparison 1 Massage versus usual care, Outcome 16 Spontaneous vaginal birth (not pre-specified).



Study or subgroup	Massage n/N	Usual care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Bolbol-Haghighi 2016	49/50	47/50		35.48%	1.04[0.96,1.13]
Janssen 2008	20/37	25/40		19.83%	0.86[0.59,1.27]
Kimber 2008	20/30	17/30		18.87%	1.18[0.79,1.76]
Levett 2016	60/88	39/83		25.82%	1.45[1.11,1.9]
Total (95% CI)	**205**	**203**		**100%**	**1.12[0.87,1.44]**
Total events: 149 (Massage), 128 (Usual care)					
Heterogeneity: Tau^2=0.04; Chi^2=11.19, df=3(P=0.01); I^2=73.19%					



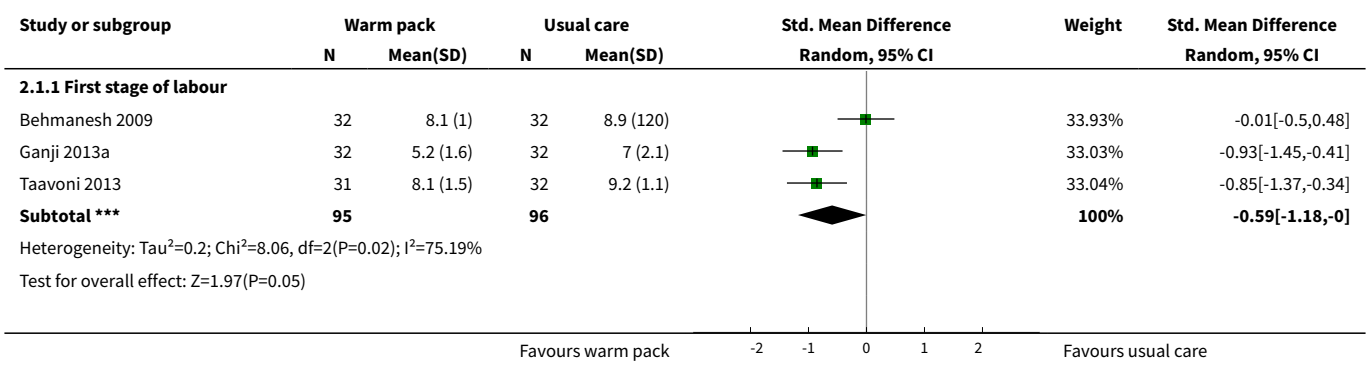
Analysis 1.17. Comparison 1 Massage versus usual care, Outcome 17 Resuscitation of newborn (not pre-specified).

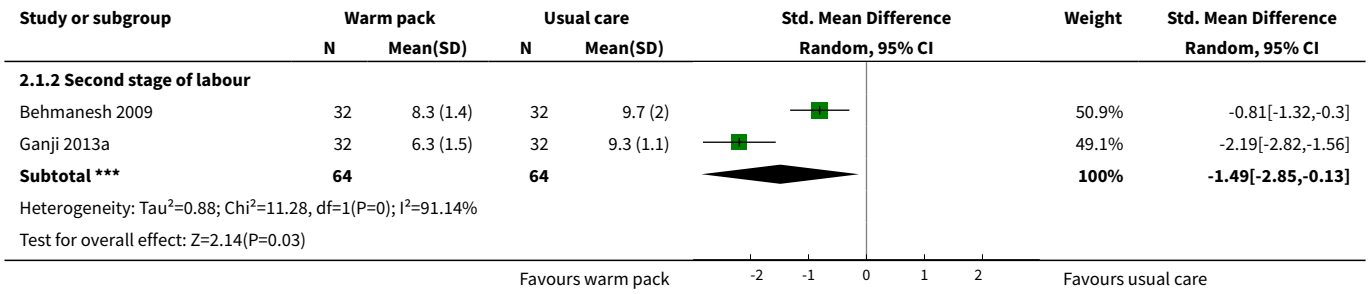


Comparison 2. Warm pack versus usual care

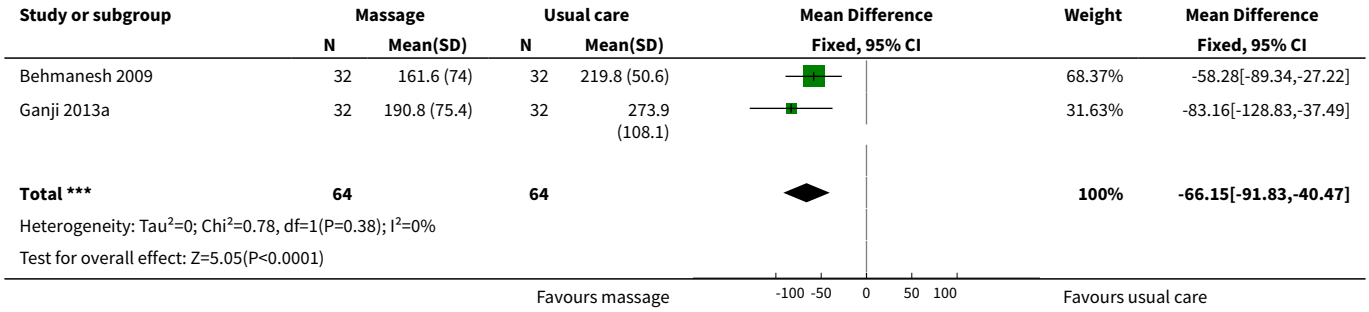
Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Pain intensity	3		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 First stage of labour	3	191	Std. Mean Difference (IV, Random, 95% CI)	-0.59 [-1.18, -0.00]
1.2 Second stage of labour	2	128	Std. Mean Difference (IV, Random, 95% CI)	-1.49 [-2.85, -0.13]
2 Length of labour (minutes)	2	128	Mean Difference (IV, Fixed, 95% CI)	-66.15 [-91.83, -40.47]

Analysis 2.1. Comparison 2 Warm pack versus usual care, Outcome 1 Pain intensity.





Analysis 2.2. Comparison 2 Warm pack versus usual care, Outcome 2 Length of labour (minutes).



Comparison 3. Thermal manual methods versus usual care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain intensity	1	96	Mean Difference (IV, Fixed, 95% CI)	-1.44 [-2.24, -0.65]
1.1 Cold packs versus usual care	1	48	Mean Difference (IV, Fixed, 95% CI)	-1.43 [-2.56, -0.30]
1.2 Intermittent hot and cold packs versus usual care	1	48	Mean Difference (IV, Fixed, 95% CI)	-1.46 [-2.59, -0.33]
2 Assisted vaginal birth	1	96	Risk Ratio (M-H, Fixed, 95% CI)	0.52 [0.08, 3.54]
2.1 Cold packs versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	0.17 [0.01, 3.99]
2.2 Intermittent hot and cold pack versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	1.55 [0.07, 35.94]
3 Length of labour (minutes)	1	96	Mean Difference (IV, Fixed, 95% CI)	-78.24 [-118.75, -37.73]
3.1 Cold packs versus usual care	1	48	Mean Difference (IV, Fixed, 95% CI)	-83.47 [-140.50, -26.44]
3.2 Intermittent hot and cold packs versus usual care	1	48	Mean Difference (IV, Fixed, 95% CI)	-72.91 [-130.46, -15.36]

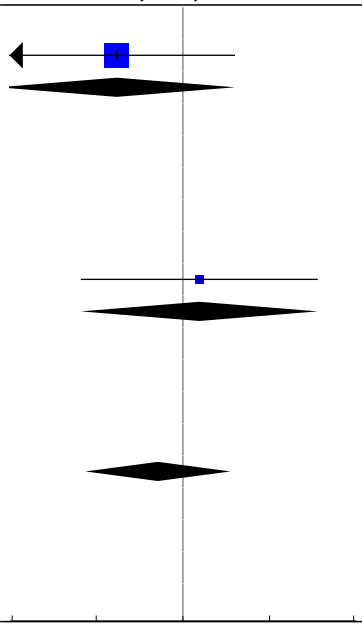
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4 Need for augmentation with oxytocin	1	96	Risk Ratio (M-H, Fixed, 95% CI)	0.94 [0.63, 1.41]
4.1 Cold packs versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	1.0 [0.55, 1.82]
4.2 Intermittent hot and cold pack versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	0.89 [0.51, 1.55]
5 Episiotomy	1	96	Risk Ratio (M-H, Fixed, 95% CI)	0.97 [0.86, 1.09]
5.1 Cold packs versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	0.9 [0.74, 1.09]
5.2 Intermittent hot and cold pack versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.90, 1.19]
6 First degree tear (not pre-specified)	1	96	Risk Ratio (M-H, Fixed, 95% CI)	1.5 [0.32, 7.02]
6.1 Cold packs versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	2.5 [0.32, 19.64]
6.2 Intermittent hot and cold pack versus usual care	1	48	Risk Ratio (M-H, Fixed, 95% CI)	0.5 [0.03, 7.49]

Analysis 3.1. Comparison 3 Thermal manual methods versus usual care, Outcome 1 Pain intensity.

Study or subgroup	Thermal methods N	Thermal methods Mean(SD)	Usual care N	Usual care Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
3.1.1 Cold packs versus usual care							
Ganji 2013a	32	5.5 (1.3)	16	7 (2.1)		50.13%	-1.43[-2.56,-0.3]
Subtotal ***	**32**		**16**			**50.13%**	**-1.43[-2.56,-0.3]**
Heterogeneity: Not applicable							
Test for overall effect: Z=2.48(P=0.01)							
3.1.2 Intermittent hot and cold packs versus usual care							
Ganji 2013a	32	5.5 (1.4)	16	7 (2.1)		49.87%	-1.46[-2.59,-0.33]
Subtotal ***	**32**		**16**			**49.87%**	**-1.46[-2.59,-0.33]**
Heterogeneity: Tau^2=0; Chi^2=0, df=0(P<0.0001); I^2=100%							
Test for overall effect: Z=2.53(P=0.01)							
Total ***	**64**		**32**			**100%**	**-1.44[-2.24,-0.65]**
Heterogeneity: Tau^2=0; Chi^2=0, df=1(P=0.97); I^2=0%							
Test for overall effect: Z=3.54(P=0)							
Test for subgroup differences: Chi^2=0, df=1 (P=0.97), I^2=0%							

Analysis 3.2. Comparison 3 Thermal manual methods versus usual care, Outcome 2 Assisted vaginal birth.

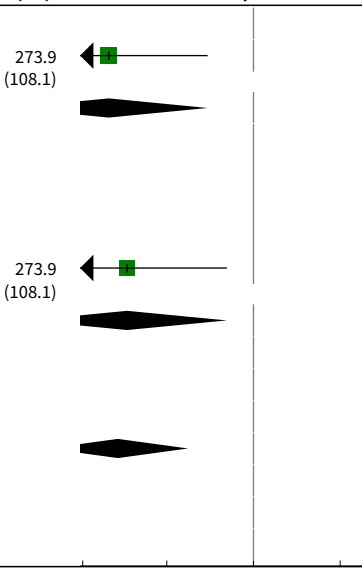
Study or subgroup	Thermal methods n/N	Usual care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.2.1 Cold packs versus usual care					
Ganji 2013a	0/32	1/16		75%	0.17[0.01,3.99]
Subtotal (95% CI)	**32**	**16**		**75%**	**0.17[0.01,3.99]**
Total events: 0 (Thermal methods), 1 (Usual care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=1.1(P=0.27)					
3.2.2 Intermittent hot and cold pack versus usual care					
Ganji 2013a	1/32	0/16		25%	1.55[0.07,35.94]
Subtotal (95% CI)	**32**	**16**		**25%**	**1.55[0.07,35.94]**
Total events: 1 (Thermal methods), 0 (Usual care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.27(P=0.79)					
Total (95% CI)	**64**	**32**		**100%**	**0.52[0.08,3.54]**
Total events: 1 (Thermal methods), 1 (Usual care)					
Heterogeneity: Tau^2=0; Chi^2=0.94, df=1(P=0.33); I^2=0%					
Test for overall effect: Z=0.67(P=0.5)					
Test for subgroup differences: Chi^2=0.94, df=1 (P=0.33), I^2=0%					



Favours thermal methods — Favours usual care

Analysis 3.3. Comparison 3 Thermal manual methods versus usual care, Outcome 3 Length of labour (minutes).

Study or subgroup	Thermal methods N	Thermal methods Mean(SD)	Usual care N	Usual care Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
3.3.1 Cold packs versus usual care							
Ganji 2013a	32	190.4 (60.9)	16	273.9 (108.1)		50.46%	-83.47[-140.5,-26.44]
Subtotal ***	**32**		**16**			**50.46%**	**-83.47[-140.5,-26.44]**
Heterogeneity: Not applicable							
Test for overall effect: Z=2.87(P=0)							
3.3.2 Intermittent hot and cold packs versus usual care							
Ganji 2013a	32	201 (64.9)	16	273.9 (108.1)		49.54%	-72.91[-130.46,-15.36]
Subtotal ***	**32**		**16**			**49.54%**	**-72.91[-130.46,-15.36]**
Heterogeneity: Not applicable							
Test for overall effect: Z=2.48(P=0.01)							
Total ***	**64**		**32**			**100%**	**-78.24[-118.75,-37.73]**
Heterogeneity: Tau^2=0; Chi^2=0.07, df=1(P=0.8); I^2=0%							
Test for overall effect: Z=3.79(P=0)							
Test for subgroup differences: Chi^2=0.07, df=1 (P=0.8), I^2=0%							



Favours thermal methods — Favours usual care

Analysis 3.4. Comparison 3 Thermal manual methods versus usual care, Outcome 4 Need for augmentation with oxytocin.

Study or subgroup	Thermal methods n/N	Usual care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.4.1 Cold packs versus usual care					
Ganji 2013a	16/32	8/16		47.06%	1[0.55,1.82]
Subtotal (95% CI)	**32**	**16**		**47.06%**	**1[0.55,1.82]**
Total events: 16 (Thermal methods), 8 (Usual care)					
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					
3.4.2 Intermittent hot and cold pack versus usual care					
Ganji 2013a	16/32	9/16		52.94%	0.89[0.51,1.55]
Subtotal (95% CI)	**32**	**16**		**52.94%**	**0.89[0.51,1.55]**
Total events: 16 (Thermal methods), 9 (Usual care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.42(P=0.68)					
Total (95% CI)	**64**	**32**		**100%**	**0.94[0.63,1.41]**
Total events: 32 (Thermal methods), 17 (Usual care)					
Heterogeneity: Tau^2=0; Chi^2=0.08, df=1(P=0.78); I^2=0%					
Test for overall effect: Z=0.29(P=0.77)					
Test for subgroup differences: Chi^2=0.08, df=1 (P=0.78), I^2=0%					

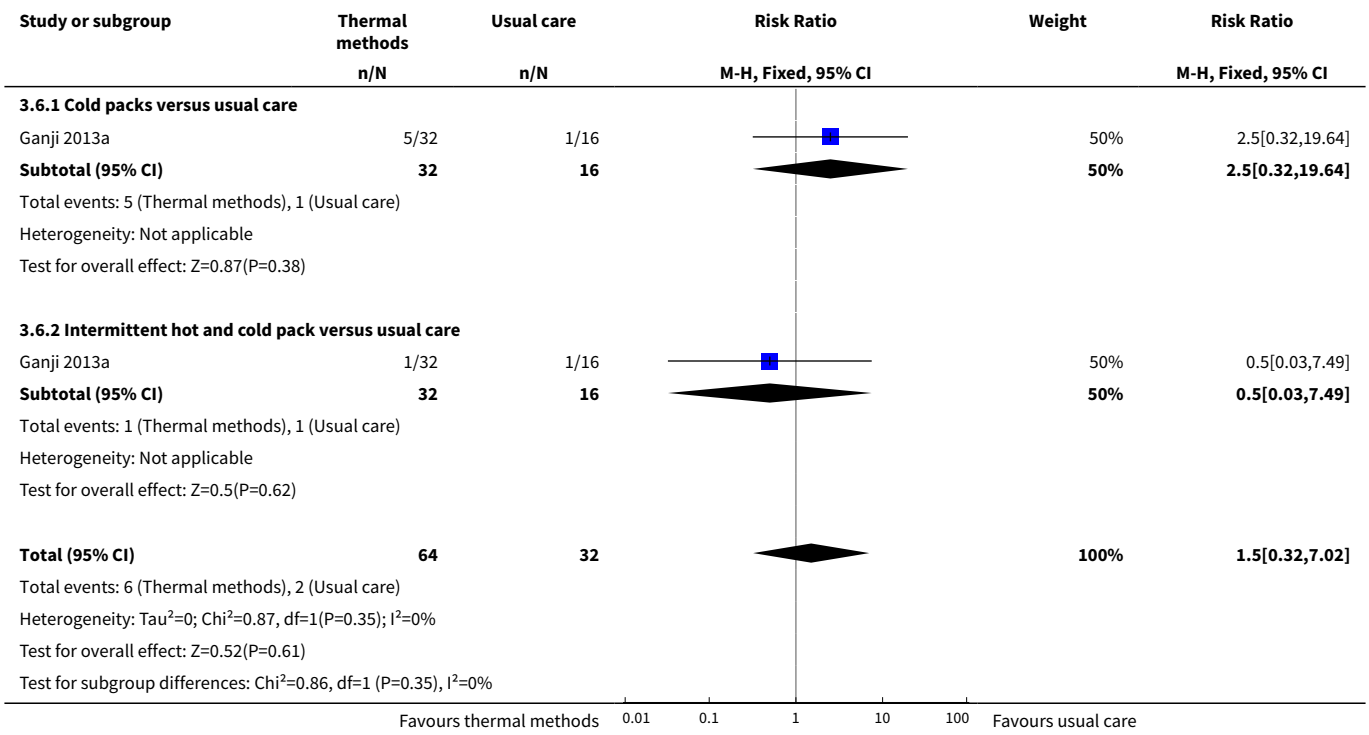
Favours thermal methods — Favours usual care

Analysis 3.5. Comparison 3 Thermal manual methods versus usual care, Outcome 5 Episiotomy.

Study or subgroup	Thermal methods n/N	Usual care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.5.1 Cold packs versus usual care					
Ganji 2013a	27/32	15/16		50%	0.9[0.74,1.09]
Subtotal (95% CI)	**32**	**16**		**50%**	**0.9[0.74,1.09]**
Total events: 27 (Thermal methods), 15 (Usual care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=1.06(P=0.29)					
3.5.2 Intermittent hot and cold pack versus usual care					
Ganji 2013a	31/32	15/16		50%	1.03[0.9,1.19]
Subtotal (95% CI)	**32**	**16**		**50%**	**1.03[0.9,1.19]**
Total events: 31 (Thermal methods), 15 (Usual care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.46(P=0.65)					
Total (95% CI)	**64**	**32**		**100%**	**0.97[0.86,1.09]**
Total events: 58 (Thermal methods), 30 (Usual care)					
Heterogeneity: Tau^2=0; Chi^2=1.37, df=1(P=0.24); I^2=27.14%					
Test for overall effect: Z=0.56(P=0.58)					
Test for subgroup differences: Chi^2=1.26, df=1 (P=0.26), I^2=20.73%					

Favours thermal methods — Favours usual care

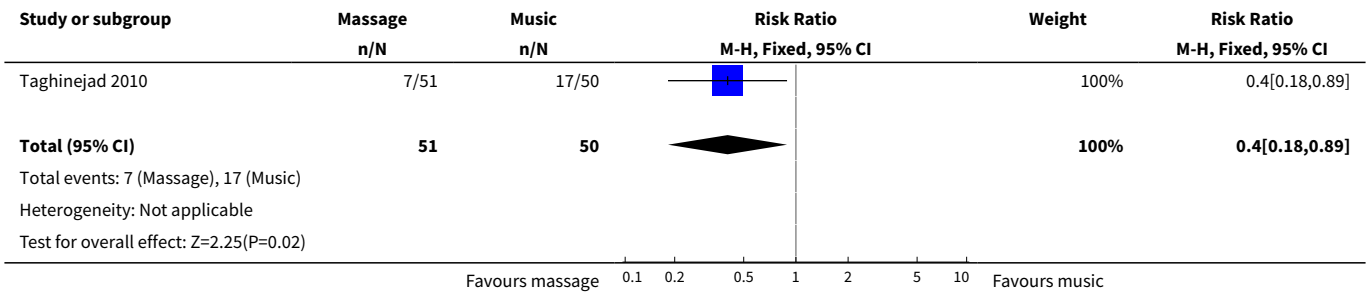
Analysis 3.6. Comparison 3 Thermal manual methods versus usual care, Outcome 6 First degree tear (not pre-specified).



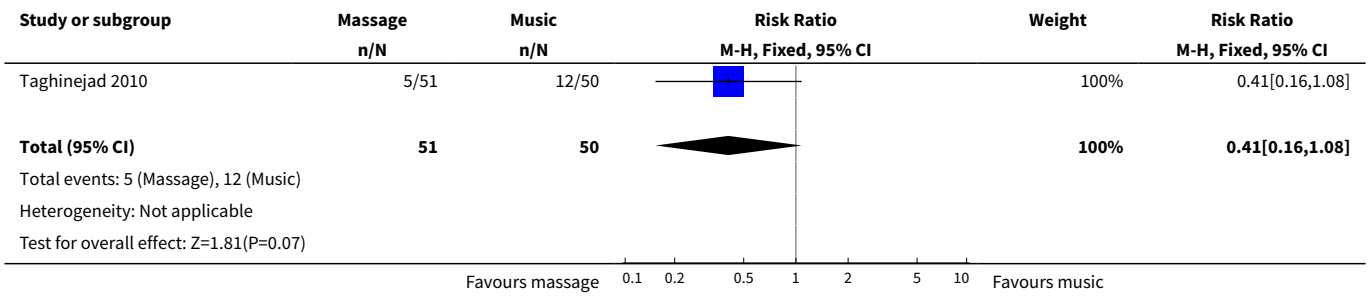
Comparison 4. Massage versus music

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain intensity	1	101	Risk Ratio (M-H, Fixed, 95% CI)	0.40 [0.18, 0.89]
2 Use of pharmacological pain relief	1	101	Risk Ratio (M-H, Fixed, 95% CI)	0.41 [0.16, 1.08]

Analysis 4.1. Comparison 4 Massage versus music, Outcome 1 Pain intensity.



Analysis 4.2. Comparison 4 Massage versus music, Outcome 2 Use of pharmacological pain relief.



APPENDICES

Appendix 1. CENTRAL search strategy

The authors wrote and ran the following search:

#1 (labor or labour):ti,ab,kw

#2 (labor or labour):ti,ab,kw or (childbirth or child-birth or child birth):ti,ab,kw and (obstetric*):ti,ab,kw and (midwife*):ti,ab,kw and (pain manage*):ti,ab,kw in Clinical Trials

#3 contraction* in Clinical Trials

#4 labo*r pain in Clinical Trials

#5 (pain management or pain* manage*) in Clinical Trials

#6 (#1 OR #2 OR #3 OR #4 OR #5)

#7 reflexology in Clinical Trials

#8 massage in Clinical Trials

#9 chiropract* in Clinical Trials

#10 osteopath* in Clinical Trials

#11 (cranio-sacral or craniosacral or cranio sacral therapy) in Clinical Trials

#12 musculoskeletal manipulations in Clinical Trials

#13 deep tissue body work in Clinical Trials

#14 myofacial release in Clinical Trials

#15 neuromuscular therapy in Clinical Trials

#16 shiatsu or tui na in Clinical Trials

#17 therapeutic touch in Clinical Trials

#18 trigger point in Clinical Trials

#19 myotherapy in Clinical Trials

#20 zero balancing in Clinical Trials

#21 (#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20)

#22 (#6 AND #21)

#23 placebo controlled in Clinical Trials

#24 randomised controlled trials in Clinical Trials

#25 randomly in Clinical Trials

#26 random assignment in Clinical Trials

#27 (#23 OR #24 OR #25 OR #26)

#28 (#22 AND #27)

Appendix 2. MEDLINE search strategy

Authors wrote and ran the following search:

1 Labor, Obstetric/ or Labo*r.mp.

2 (childbirth or child birth or child-birth).

3 (labour or labor).ab.

4 pain$.mp.

5 pain manag$.mp. or exp pain/

6 1 or 2 or 3 or 4 or 5

7 exp reflexology/

8 exp massage/

9 chiropract$.mp. or osteopath$ manipulation/ [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]

10 (cranio-sacral or craniosacral or cranio sacral therapy).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]

11 exp Musculoskeletal Manipulations/ or deep tissue bodywork.mp.

12 myofascial release.tw.

13 neuromuscular therapy.tw.

14 (shiatsu or tui na).tw.

15 therapeutic touch.tw.

16 trigger point.tw.

17 myotherapy.tw.

18 zero balancing.tw.

19 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18

20 6 and 19

21 randomi*ed controlled trial.pt.

22 controlled clinical trial.pt.

23 (randomised or randomized).ab.

24 placebo.ab.

25 drug therapy.fs.

26 randomly.ab.

27 trial.ab.

28 groups.ab.

29 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28

30 (animals not (humans and animals)).sh.

31 29 not 30

32 20 and 31

Appendix 3. CINAHL search strategy

Authors wrote and ran the following search:

S37. S35 and S36

S36. (S19 and S26)

S35. (S27 or S28 or S29 or S30 or S31 or S32 or S33 or S34)

S.34. AB quantitative

S33. AB quantitative trials

S32. AB placebo$

S31. AB random allocation

S30. AB random assignment

S29. AB randomi*ed controlled trials

S28. AB randomi?ed control$ trial$

S27. AB clinical trial*

S26. (S20 or S21 or S22 or S23 or S24 or S25)

S25. AB midwife$

S24. AB (pain or labo*r pain)

S23. AB pain manage$

S22. AB obstetric

S21. AB (childbirth or child birth or child-birth)

S20. AB (labour or labor)

S19. S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18

S18. MW zero balancing

S17. MW trigger point

S16. MW therapeutic touch

S15. MW shiatsu

S14. MW reflexology

S13. MW osteopath

S12. MW osteopathic$

S11. MW neuromuscular massage

S10. MW neuromuscular facilitation

S9. MW myotherapy

S8. MW myofacial release

S7. MW (musculo-skeletal or musculoskeletal or musculo skeletal)

S6. MW manual therapy$

S5. MW massage

S4. MW Deep tissue massage

S3. MW (craniosacral or cranio sacral or cranio-sacral therapy)

S2. MW Chiropractic$

S1. MW (Bio energy or bioenergy or bio-energy therapy)

Appendix 4. Search terms used Clinical Trials Registries

Authors searched

1. Australian New Zealand Clinical Trials Registry (4 August 2017)

2. Chinese Clinical Trial Registry (4 August 2017)

3. ClinicalTrials.gov (4 August 2017)

4. National Center for Complementary and Integrative Health (4 August 2017)

5. WHO International Clinical Trials Registry Platform (ICTRP) (4 August 2017).

We used the terms: obstetric* OR matern* OR labo*r OR birth OR childbirth OR labo*r pain; AND reflexology OR OR massage OR chiropractic/ osteopathic manipulation OR craniosacral therapy OR deep tissue bodywork OR deep tissue massage OR healing touch OR myofascial release OR neuromuscular therapy OR shiatsu OR trigger point OR myotherapy OR zero balancing OR bio*energy* AND clinical trials OR random* OR controlled trials OR placebo

WHAT'S NEW

Date	Event	Description
30 June 2017	New search has been performed	Search updated. In this update we have included eight new trials. Altogether the review now includes 14 trials.
30 June 2017	New citation required but conclusions have not changed	Massage and manual methods may be helpful; further trials are needed. We did not identify any trials examining reflexology.

CONTRIBUTIONS OF AUTHORS

Machiko Suganuma and Carmel Collins conducted the additional searches. Caroline Smith, Kate Levett, Carolyn Ee, Machiko Suganuma and Carmel Collins reviewed trials and performed data extraction. All authors contributed to writing and commenting on the review and its update. Caroline Smith is the guarantor of the review.

DECLARATIONS OF INTEREST

Caroline A Smith: As a medical research institute, NICM receives research grants and donations from foundations, universities, government agencies and industry. Sponsors and donors provide untied and tied funding for work to advance the vision and mission of the Institute. I am an author on one of the papers included in this review (Levett 2016).

Kate M Levett: Kate is the primary author on one of the papers included in the review (Levett 2016). Data extraction of this paper was performed by co-author Machiko Suganuma and Therese Dowswell, Research Associate, Cochrane Pregnancy and Childbirth. Kate is employed at The University of Notre Dame, School of Medicine Sydney, and as a medical school receives research grants and donations from Foundations, Government agencies and industry. Kate Levett offers private acupressure for labour and birth education classes in Sydney Australia, these classes include complementary therapy strategies, such as relaxation and massage, for pain relief in labour.

Carmel T Collins: none known.

Hannah G Dahlen: I am an author on one of the papers included in the review (Levett 2016).

Carolyn C Ee: As a medical research institute, NICM receives research grants and donations from foundations, universities, government agencies and industry. Sponsors and donors provide untied and tied funding for work to advance the vision and mission of the Institute.

Machiko Suganuma: none known.

SOURCES OF SUPPORT

Internal sources

- University of Western Sydney, Women's and Children's Health Research Institute, Child, Youth and Women's Health Services, Australia.

External sources

- WHO UNDP-UNFPA-UNICEF-WHO-World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP), Department of Reproductive Health and Research (RHR), World Health Organization, Switzerland.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

This review differs from the previously published Cochrane systematic review 'Complementary and alternative therapies for pain management in labour' (Smith 2006) which has now been revised to three separate reviews.

Spontaneous vaginal birth and resuscitation of the newborn were not pre-specified outcomes of the review, but have been added in this updated version (2017) and four 'Summary of findings' tables have been added.

We have amended the methods slightly in this update (2017) to state that we will include quasi-RCTs in analyses and conduct sensitivity analyses to check on the impact of including them. In the previous version of this review (Smith 2012) we stated that 'we will not include results from quasi-RCTs in the analyses, but we may discuss them in the text if little other evidence is available.'

NOTES

This review is one of three which, collectively, update the previous review on a range of complementary therapies (Smith 2006). This review includes only trials of massage and other manual methods for pain relief in labour.

INDEX TERMS

Medical Subject Headings (MeSH)

Analgesics [therapeutic use]; Cryotherapy [methods]; Hyperthermia, Induced [methods]; Labor Onset [physiology]; Labor Pain [*therapy]; Massage; Music Therapy; Pain Management [*methods]; Randomized Controlled Trials as Topic

MeSH check words

Female; Humans; Pregnancy