2024

Efficacy of Complimentary Manual Therapies for Labor Pain Management

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by

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A Scholarly Project

Submitted to the Graduate Faculty of the University of North Dakota

in partial fulfillment of the requirements of the degree of

Master of Physician Assistant Studies

Grand Forks, North Dakota

May 2024

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Acknowledgments

I would like to thank my advisor Julie Solberg and course director Russ Kauffman for their guidance and expertise on this project. I would also like to acknowledge Megan Denis and Dr. Marilyn Klug for their insight and recommendations. Finally, I would like to thank my family and friends for their support, motivation, and encouragement during this program, especially my nephew, Emmitt.

Abstract

Labor and delivery pain is commonly considered to be the most pain a woman will ever experience. Options for pain control during labor include pharmacological and nonpharmacological. The purpose of this systematic literature is to determine if complementary manual therapies such as massage therapy, acupressure, and reflexology are effective nonpharmacologic management tools for labor pain. The electronic databases PubMed and ClinicalKey were searched, and the ten studies chosen for this review were randomized controlled trials published within the past ten years. Current research provides significant data supporting these three complementary modalities as effective nonpharmacologic management tools to control labor pain. Pain was effectively reduced at multiple points throughout the labor process in each of these studies. Future research could be conducted in the US using therapies in combination as well as using therapies to supplement pharmacological pain management. This research could aid in providing patient education on additional pain control methods during the childbirth process.

Keywords: massage, massage therapy, acupressure, reflexology, foot massage, labor pain, birth, and parturition

Introduction

Childbirth is a highly individual experience and labor pain is commonly considered to be the most pain a woman will ever experience. Uterine contractions, perineal pressure, as well as referred low back and thigh pain contribute to the pain experienced during labor. Options for pain control during labor include pharmacological and nonpharmacological. In the United States, analgesics and anesthetics are the first-line for pain control during labor and delivery, with three-fourths of women opting for neuraxial anesthesia (Smith et al., 2021). Nonpharmacologic pain management is an alternative option for women. Common nonpharmacological labor pain management techniques include movement, breathing exercises, music therapy, water immersion, and manual therapies such as massage, acupressure, and reflexology. The goal of nonpharmacologic pain management is not to eliminate pain, but rather to reduce the perceived pain to provide a better labor experience. Massage is the manipulation of soft tissues including skin and muscles, to reduce stress and promote relaxation by releasing serotonin, oxytocin, and dopamine and reducing cortisol levels (Maghalian et al., 2022). Acupressure is a type of massage that applies pressure along specific body points based on acupuncture meridian (channel) principles. Reflexology and foot massage utilize pressure points in the feet to relieve tension throughout the body. The purpose of this literature review is to determine if complementary therapies are effective nonpharmacologic pain management tools during labor.

Statement of the Problem

Acute pain is a characteristic element of the normal physiological process of labor. Though pharmacological analgesia and anesthesia during labor are generally regarded as safe, some women prefer nonpharmacological pain management. Concerns for the use of pharmacological analgesics and anesthesia during labor include drowsiness, nausea, vomiting,

decreased control during the laboring process, decreased mobility, delayed ability to breastfeed, spinal cord injury, as well as short-term fetal effects such as slowed breathing, reduced reflexes, and heart rate changes (American College of Obstetricians and Gynecologists, 2022). Prolonged labor time and increased risk of cesarean section with the use of pharmacologic pain management are also apprehensions, though there are mixed reports on the validity of these concerns.

Research Question

In pregnant women, are complementary manual therapies such as massage therapy, acupressure, and reflexology effective nonpharmacologic management tools for labor pain?

Methods

A comprehensive literature review was conducted using the electronic databases PubMed and ClinicalKey. Keywords and MeSH terms used included massage, massage therapy, acupressure, reflexology, foot massage, labor pain, birth, and parturition. Studies included in the analysis were randomized controlled trials published within the past ten years. A total of 99 studies were produced from this search. Excluded studies included meta-analyses, systematic reviews, studies that did not analyze labor pain, interventions performed outside of active labor, therapies other than manual therapy such as ice, electric stimulation, or aromatherapy, those including perineal massage, or not relating to the research question. Ten studies met the inclusion criteria and were analyzed for this literature review.

Literature Review

Theme 1 – Labor pain control with low back or sacral massage vs no pain management

Akköz Çevik & Karaduman (2019) conducted a randomized control study on 60 participants to determine if sacral massage is an effective way to reduce labor pain and anxiety.

The purpose of the study was to ascertain if massage given at three different points of cervical dilation changed perceived pain intensity, anxiety level, and labor satisfaction. For this review, only labor pain will be analyzed. The initial pool of participants assessed for eligibility was 342 primiparous women who delivered at Bagcılar Training and Research Hospital, Delivery Unit in Istanbul, Turkey. A sample size of at least 30 participants in each group was determined to be representative of the population. From this initial pool, 282 individuals were excluded from the study for not meeting study requirements, which included 19- 40 years-old, primiparous women without complications that may cause dystocia, healthy fetus, having a singleton pregnancy between 38 and 42 weeks gestation, spontaneous onset of labor, no anesthesia or analgesics used during the first stage of labor, absence of a high-risk pregnancy or chronic illness, and were able to communicate verbally (Akköz Çevik & Karaduman, 2019.) Once assigned to either the experimental or control group, no participants were excluded or requested to withdraw from the study. Socioeconomic demographics were collected from the participants, but these data points did not contribute to the inclusion or exclusion criteria of the study. The experimental group received 30 minutes of massage therapy at the sacral region, while under doctor supervision at 3-4cm (latent phase), 5-7cm (active phase), and 8-10 cm (transition phase) dilation. Participants laid in the left lateral decubitus position while massage was performed. Pain intensity was recorded after each massage treatment and during the same stage of dilation in the control group. To control for variation in massage technique, all 30 participants in the massage group received therapy from the same researcher who had received training from a physical therapist and utilized effleurage and vibration massage techniques during this study. Pain was recorded at three points using the VAS, 0-10 pain scale. A postpartum interview form was used to assess the participants in both groups' overall satisfaction with their labor. Routine nursing/midwifery care

was otherwise similar between the two groups being assessed. Results of the study are as follows: pain increased as dilation increased, but mean pain intensity was lower in the sacral massage group than the control during all 3 stages of labor; there was a statistically significant lower pain reported by the massage group compared to the control group while 3-4cm, 5-7cm, and 8-10 cm dilated. At 3-4 cm, pain intensity was rated at 3.57 +/- 1.43 in the massage group and 4.67 +/- 1.37 in the control group ($p<0.05$); At 5-7 cm, pain intensity was rated at 7.03+/- 1.5 in the massage group and 8.43 +/- 1.17 in the control group ($p<0.001$); At 8-10 cm, pain intensity was rated at 8.83 +/- 1.78 in the massage group and 9.7 +/- 0.53 in the control group ($p<0.05$). There were no adverse effects of this study. The discussion states the findings of this study paralleled the findings of similar studies in that massage therapy is an effective technique to reduce perceived pain during labor. The overall conclusion of this study is that sacral massage during labor is an effective technique to reduce pain during the labor process.

Strengths of this study include randomized control, sample size, inclusion criterion, standard participant positioning during massage, and similar demographics between the experimental and control groups. Weaknesses of this study include limited description of specific massage strokes used, which could easily lead to variation and subjectivity in the massage technique administered even if the same style was used, massage being performed by a researcher with no prior career experience in massage, no explanation who performed the cervical measurements and this could be subject to variation if performed by more than one person, objective reporting on a subjective metric (pain), and the research participants being informed about the study which could have potentially led to a placebo effect.

Maghalian et al. (2022) conducted a randomized control study on 90 participants to determine the effect of Swedish massage and interferential electrical stimulation (IES) on labor

pain, childbirth experience, and secondary outcomes including duration of active phase labor, childbirth satisfaction, fetal heart rate abnormalities, and APGAR scores. For this literature analysis, massage related to pain control is being evaluated. The purpose of the study was to ascertain if massage given at two different points of cervical dilation changed pain intensity. The initial pool of participants assessed for eligibility was 385 primiparous women who delivered at Taleghani and Al-Zahras Hospitals in Tabriz, Iran. From this pool, 295 individuals were excluded from the study for not meeting study requirements, which required primiparous pregnant women, singleton pregnancies between 38 and 40 weeks gestation, being at the beginning of active phase (cervical dilation of 4 cm), cephalic fetal presentation, no rupture of membranes, lack of drug addiction or smoking, low-risk pregnancy and no prior history of chronic disease, meconium-stained amniotic fluid, skin disorders, bone fracture (at the therapeutic site), sensitivity to olive oil, or receive pain control via epidural anesthesia or intravenous infusion (Maghalian et al., 2022.) Also excluded from the study were four individuals who needed a Cesarean section during the first stage of labor. A demographic-social questionnaire was given to the participants, with the mean statistics being recorded in the paper, though this information did not contribute to the exclusion criteria. The Swedish massage experimental group received 30-45 minutes of massage therapy while in the mother's desired position, at the T10-S4 region at 4 cm and 8-10 cm dilation. Two different massage techniques were utilized, effleurage and petrissage. This was compared to the control group, who did not receive massage, and a third group that received IES in the same region at the same stages of labor. Pain was recorded at the beginning of the intervention (4 cm dilation), and then every hour during the first stage of labor using Visual Analogue Scale (VAS) (Maghalian et al., 2022.) Results of the study are as follows: pain increased as dilation increased, but mean pain intensity was lower in the massage group than the

control; there was a meaningful variance in pain between the control and the massage groups while 7 cm dilated. The mean pain intensity was rated at 8.0 +/- 1.00 in the massage group after intervention during active labor and 9.0 +/- .06 in the control group ($p<0.001$). The overall conclusion by the authors of this study was that massage therapy during labor significantly decreases labor pain and increases delivery satisfaction. There were no adverse effects of this study. The authors recommend this study could be repeated on multiparous women and compared to primiparous women. Strengths of this study include randomized control, sample size, inclusion criterion, similar demographics between the experimental and control groups, and blinding of the researchers collecting the data, though it is not possible to blind the participants. Weaknesses of this study included a variety of massage strokes used, which could easily lead to variation and subjectivity in the massage technique administered, participant position variability, most participants were low to middle-income, primiparous subjects, and objective reporting on subjective metrics (pain and labor satisfaction). The researcher received training and performed the massage on the participants; results may have been different if a massage therapist with prior experience in the field had performed the massage.

Shahbazzadegan & Nikjou (2022) conducted a randomized control study on 60 participants to determine the most effective cervical dilation from massage to reduce labor pain and anxiety. The purpose of the study was to ascertain if massage given at 3 different points of cervical dilation changes pain intensity and anxiety. For this review, only labor pain will be analyzed. The initial pool of participants assessed for eligibility was 123 primiparous women who were referred to deliver at Alavi Hospital in Ardabil, Iran. From this pool, 37 individuals were excluded from the study for not meeting study requirements, which include married, normal medical and family conditions, having a normal, wanted, singleton and full-term

pregnancy, vertex presentations, onset cervix dilation, absence of neurological and psychological problems, having met massage criteria (no skin disease or lesions) (Shahbazzadegan & Nikjou, 2022.) Also excluded from the study were 20 individuals who declined to participate, and nine individuals were not included in the analysis for other reasons. Alavi Hospital is a public hospital, so participants were generally of the same socioeconomic class. Pain intensity was recorded at the beginning of active labor. The experimental group received 20 minutes of massage therapy at the T10-S4 region, while in the mother's desired position, at 5, 7, and 9 cm dilation. This was compared to the control group at the same stages of labor, who did not receive massage. To control for variation in massage technique, all 30 participants in the massage group received therapy from the same researcher utilizing the Kimber massage technique. Cervix measurements were also performed by the same researcher to minimize variability. Pain was recorded at the four points using a 0-10 pain scale. Routine medical care was otherwise similar between the two groups being assessed. Results of the study are as follows: pain increased as dilation increased, but mean pain intensity was lower in the massage group than the control; there was a meaningful variance in pain between the control and the massage groups while 7 cm dilated. Pain intensity was rated at 4.79 +/- 1.18 in the massage group and 7.17 +/- 1.37 in the control group ($p<0.0001$) (Shahbazzadegan & Nikjou, 2022.) The overall conclusion by the authors of this study was that 7 cm cervical dilation is the most appropriate time to provide massage therapy for pain reduction in labor. There were no adverse effects of this study. The discussion states the findings of this study paralleled the findings of similar studies in that massage therapy is an effective pain-reducing technique during labor, but this study is the first of its kind to determine when the best time is during labor for it to be most beneficial. Strengths of this study include randomized control, sample size, inclusion criterion, and similar demographics

between the experimental and control groups. Weaknesses of this study included limited description of specific massage strokes used, which could easily lead to variation and subjectivity in the massage technique administered even if the same style was used, objective reporting on a subjective metric (pain), and the research participants being informed about the study which could have potentially led to a placebo effect. Letting the participants choose the position they receive massage creates variation and the position in which the control group labors in was not mentioned. There is no mention of researcher blinding when pain ratings were being collected. The evaluation of the statistics was limited.

Silva Gallo et al. (2013) conducted a randomized control study on 46 participants to analyze the effects of massage therapy during labor. The purpose of the study was to determine if massage reduced labor pain, changed the characteristics of labor pain, improved maternal and fetal outcomes, and if the laboring women were satisfied with a physiotherapist performing the massage. The initial pool of prospective participants was comprised of 249 women, ≥ 37 weeks gestation who presented to the Reference Center of Women's Health of Ribeirão Preto-MATER, state of São Paulo, Brazil for delivery; 203 individuals were excluded from the study for not meeting the study requirements, which included primigravida, low risk pregnancy, spontaneous initiation of labor, single fetus in cephalic position, cervical dilation of 4-5 cm, literacy, and lack of pharmaceutical administration upon arrival to the hospital (Silva Gallo et al., 2013). The experimental group received 30 minutes of massage from a physiotherapist during active labor while 4-5cm dilated. This was compared to a control group at the same stage of labor that did not receive manual therapy. A physiotherapist was present for the control group but was only able to answer participant questions. A second physiotherapist conducted pain assessments of both groups using a 0-100mm visual analog scale, both at the beginning of the session and the end.

The quality of pain was assessed using the McGill Pain Questionnaire. Pain location reported by the participants as well as maternal and neonatal outcomes were also recorded by a blinded secondary physiotherapist. Routine medical care was otherwise similar between the two groups during the phase of labor being assessed. Results of the study are as follows: participants in the experimental group reported pain improvement by a mean of 17mm (SD 14) from baseline while the control group reported their pain to have increased by 3mm using the visual analog scale. This was an overall improvement in pain reported by 20mm (95% CI 10-31) by the participants who received massage therapy during labor (Silva Gallo et al., 2013). The researcher had determined a difference of 13mm was necessary to be considered a clinically significant value. Massage therapy did not change the quality or location of pain as reported by the participants. There was no statistically significant difference in maternal and newborn outcomes between the two groups. Additionally, there were no adverse effects of massage therapy during labor. The authors of this study concluded that massage therapy during active labor decreases reported pain appreciably. Due to the ease of administration of this pain control technique and lack of side effects, this technique can easily be employed by either a trained professional or a member of the laboring women's support team to reduce pain (Silva Gallo et al., 2013). Strengths of this study include randomized control, blinded data collected, sample size, inclusion criterion, and similar demographics between the experimental and control groups. Weaknesses of this study included variation and subjectivity in the massage technique administered, objective reporting on a subjective metric (pain), and the research participants being informed about the study which could have potentially led to a placebo effect.

Theme 2 – Labor pain control with acupressure points vs no pain management

Gönenç & Terzioglu (2020) conducted a randomized control study on 120 participants to determine the effect of massage and acupressure on relieving labor pain, reducing labor time, and increasing labor satisfaction. The purpose of the study was to discern if massage and/or acupressure changed pain intensity during the labor process, duration of labor time, and labor satisfaction. For the purpose of this literature review, effects on labor pain will only be considered. The researchers note there are several studies analyzing the use of massage and acupressure during labor, but limited analyses comparing the two modalities, and no studies using the two methods in combination. From this initial pool of participants, individuals were excluded from the study for not meeting study requirements, which required primiparous pregnant women, 20-30 years old, 38-42 weeks gestation, indicated for vaginal delivery, a single fetus in vertex presentation without obstetric complications, <4 cm cervical dilation, and no anesthesia or analgesics used during the first stage of labor (Gönenç & Terzioglu, 2020). Both modes of therapy were performed by a single researcher to control for variation. Information on sociodemographic information, pregnancy status, and prior labor experience was collected from the participants, with the mean statistics being recorded in the paper. This information did not contribute to the exclusion criteria. Participants were randomly assigned to one of four groups: massage-only, acupressure-only, massage+acupressure, and a control group that received no therapy. Labor pain was assessed in all groups before and after the therapy. Massage, acupressure, and massage+acupressure were administered to the experimental groups at cervical dilation of 3-4cm (latent phase), 6-7cm (active phase), and 8-9cm (transitional phase). The massage-only group received 30 minutes of massage therapy over the head, neck, shoulders, and extremities. The acupressure-only group received 30 minutes of acupressure over SP6 (4cm superior to the medial malleolus) using acupressure bands. The proper site was located using an

acupoint device. The massage+acupressure group received both modalities at the same time. This was compared to the control group, who did not receive massage or acupressure, but pain ratings were recorded at the same intervals. Pain was recorded using the visual analog scale (VAS), a 0-10 scale, zero being no pain and 10 being the worst possible pain. Results of the study are as follows: pain increased as dilation increased, but mean pain intensity after treatment was lower in the massage-only, acupressure-only, and massage+acupressure groups than in the control. The mean pain intensity at 3-4 cm dilation in the massage-only group was 6.36±1.10 before the intervention and 4.56±1.36 after; acupressure-only was 5.87±1.63 before the intervention and 5.43±1.85 after; massage+acupressure was 5.83±1.49 before and 4.63±1.52 after, and the control group was 5.80±1.40 and 6.16±1.46 (preintervention ($p= 0.352$); postintervention ($p=0.001$); at 6-7 cm dilation, mean pain intensity was rated in the massage-only group as 8.10 ± 0.96 before the intervention and 7.23±1.33 after; acupressure-only was 7.97±1.40 before the intervention and 7.53±1.50 after; massage+acupressure was 8.10±1.03 before and 6.93±1.23 after, and the control group was 9.20 ± 0.89 and 9.40 ± 0.77 (preintervention ($p= 0.001$); postintervention ($p=0.001$); at 8-9 cm dilation, mean pain intensity was rated in the massage-only group as 9.13 ± 0.63 before the intervention and 8.18±1.02 after; acupressure-only was 9.33±0.71 before the intervention and 9.10±0.85 after; massage+acupressure was 9.33±0.18 before and 8.73±0.69 after, and the control group was 9.96 ± 0.25 and 9.93 ± 0.25 (preintervention ($p= 0.001$); postintervention ($p<0.001$) (Gönenç & Terzioglu, 2020). The overall conclusion by the authors of this study was that massage-only and massage+acupressure were the most successful at controlling labor-related pain at all points measured. Acupressure-only showed a significant reduction in pain during the active labor phase only, though it was less than the other two intervention groups. There were no adverse effects of this study. Fetal outcomes, as determined by APGAR scores, were similar

among the four groups. The findings in the massage group are similar to other studies, showing a significant reduction in labor pain. Similar acupressure studies have mixed results with some reporting no statistically significant pain reduction benefit of acupressure. This study was the first of its kind to use massage and acupressure in conjunction. The researchers state women who received meperidine or epidural anesthesia were excluded from this study, but future studies could analyze massage and acupressure in conjunction with conventional pain control methods. Strengths of this study include randomized control, sample size, therapy provided and pain measurements at multiple times during labor, inclusion criterion, all the interventions in the study were performed by a single person, and similar demographics between the experimental and control groups. Weaknesses of this study included objective reporting on subjective metrics (pain), the location of the hospital was not listed, a large area of the body massaged, which may be hard to reproduce and the massage technique used was not defined, acupressure performed at only one location, acupressure applied with a band versus by a therapist, and the interventions being performed by a researcher who received training, though had no prior experience in therapy; results may have been different if a specialist with prior experience in the field had performed the massage and acupressure.

Mafetoni & Shimo (2016), conducted a single-blinded, randomized control study on 156 participants to determine if acupressure applied to sanyinjiao point (SP6, located four fingers above the medial malleolus) is an effective way to reduce labor pain. The purpose of the study was to ascertain if acupressure at SP6 influenced childbirth pain. The initial pool of participants assessed for eligibility was 648 primiparous women who delivered at a public teaching hospital in Dao Paula, Brazil. A sample size of at least 51 participants in each group was determined to be representative of the population. From this initial pool, 492 individuals were excluded from the

study for not meeting study requirements, which included cervical dilation ≥4 cm, two or more contractions in a 10-minute period, intact skin over the SP6 point, and a live, healthy fetus in the cephalic vertex position. Exclusionary criteria included pre-eclampsia, the need for immediate cesarean sections, using analgesics within six hours of study admission time, and placenta previa (Mafetoni & Shimo, 2016.) Socioeconomic demographics were collected from the participants, but these data points did not contribute to inclusion or exclusion criteria of the study and did not vary significantly between the groups. Participants were divided into three groups: acupressure, touch/placebo, and control. The experimental group received 20 minutes of deep pressure at SP6, the touch/placebo group received light touch at SP6 for 20 minutes, and the control group received no treatment. To control for variation in massage technique, all 104 participants in the acupressure and touch groups received treatment from the same researcher who had received 32 hours of training to apply proper pressure at the designated location. All women in the study were encouraged to perform breathing exercises during labor. Pain was recorded before, immediately after, as well as 60 minutes (VAS60) after treatment using the VAS, 0-10 pain scale. Several women (from each of the three groups) were removed from the VAS60 analysis due to the use of analgesics or birth occurring during the interim. Routine obstetric care was otherwise similar between the three groups being assessed. The results of the study are as follows: pain was reduced in the acupressure group compared to the touch and control groups. Pain before treatment: SP6 7.4 +/- 1.9, touch 7.1 +/-2.4, control 7.9 +/-1.9 ($p= 0.0929$); Pain after 20 minutes of treatment: SP6 5.9 +/-2.3, touch 7.6 +/-2.5, control 8.5 +/- 1.9 ($p <0.0001$); pain 60 minutes after treatment: SP6 6.5 +/- 2.2, touch 8.1 +/- 2.3, control 8.8 +/- 1.8 ($p <0.0001$). There were no adverse effects of this study, as APGAR scores in all three groups showed no variations. The discussion states the findings of this study paralleled the findings of similar studies in that

acupressure to SP6 effective technique to reduce perceived pain during labor. The overall conclusion of this study is that acupressure to SP6 during labor is an effective technique to reduce pain. Strengths of this study include randomized control, inclusion criterion, sample size, treatment performed by a single researcher to control for variation in technique, and similar demographics between the experimental and control groups. Weaknesses of this study include analgesic use during the study (though there was not a statistical difference in frequency of use amongst the three groups), acupressure being performed by a researcher with no prior career experience in massage, single-blinding, and objective reporting on a subjective metric (pain).

Ozgoli et al. (2016) conducted a randomized control study on 106 participants to determine the effect of acupressure on labor pain. The purpose of the study was to ascertain if acupressure applied to LI4 and BL32 at three different points of cervical dilation changed pain intensity during the labor process. The researchers were also trying to determine if there was a difference in pain intensity between the two therapy points, one being close in proximity to the site of labor (BL32- 2nd sacral foramen) and one distal (LI4- dorsal surface between the first and second metacarpals). The initial pool of participants assessed for eligibility was 117 primiparous women who delivered at Shahid Akbarabadi Hospital in Tehran, Iran. From this pool, 11 individuals were excluded from the study for not meeting study requirements, which required primiparous pregnant women, 19-35 years old, >37-weeks gestation, vertex presentation without obstetric complications, being in the active labor stage one with ≥4 cm cervical dilation, and at least three uterine contractions within 10 minutes (Ozgoli et al., 2016). A researcher was trained in the proper technique to apply acupressure to LI4 and BL32 by an acupuncture specialist. A pilot test was performed on 20 participants (10 in each group) to evaluate the correct location and technique administered by the researcher compared to the acupuncture specialist. After the pilot

study, the researchers chose to collect data at three times in the labor process: cervical dilation 4-5cm, 6-7cm, and 8-10cm. A demographic-social questionnaire was given to the participants, with the mean statistics being recorded in the paper, though this information did not contribute to the exclusion criteria. All participants were married and lived with their spouses. The participants were randomly assigned to one of three groups: acupressure applied at LI4 unilaterally (n=35), acupressure applied to BL32 bilaterally (n=35), and a control group (n=36) that received no therapy. The sample size needed in each group to be considered representative of the population was n=32. Labor pain was assessed in all groups before the therapy began. Acupressure was applied to the two experimental groups at cervical dilation 4-5cm, 6-7cm, and 8-10cm when the participants reported contraction pain. After six contractions with applied acupressure, the participants were asked to rate their pain. This was compared to the control group, who did not receive acupressure, but pain ratings were recorded at the same intervals. Pain was recorded using the numerical rating scale (NRS), a 0-10 scale, zero being no pain and 10 being the worst possible pain. Results of the study are as follows: pain increased as dilation increased, but mean pain intensity was lower in the acupressure groups than in the control. The mean pain intensity at 4-5 cm dilation in the LI4 group was 7.46 ± 0.91 before the intervention and 4.49 ± 1.65 after ($p<0.001$); BL32 was 7.69 ± 0.86 before the intervention and 3.97 ± 1.15 after ($p<0.001$), and the control group was 7.60 ± 1.09 before and 7.09 ± 1.26 after ($p<0.01$); at 6-7 cm dilation mean pain intensity was rated in the LI4 group as 8.57 ± 0.91 before the intervention and 5.11 ± 1.51 after ($p<0.001$), BL32 8.60 ± 0.81 before and 4.26 ± 1.48 after ($p<0.001$), and the control 8.60 ± 0.81 before and 8.37 ± 0.87 after ($p<0.03$); at 8-10 cm dilation, mean pain intensity was rated in the LI4 group as 9.51 ± 0.55 before and 6.14 ± 1.82 after ($p<0.001$), BL32 9.60 ± 0.61 before and 5.74 ± 1.89 after ($p<0.001$), and control 9.76 ± 0.42 before and 9.53 ± 0.88 after ($p<0.12$)

(Ozgoli et al., 2016). The overall conclusion by the authors of this study was that acupressure applied at LI4 and BL32 during labor significantly decreases labor pain at all three stages compared to the control group. BL32 provided more pain reduction than LI4 at stages one and two, but there was not a significant difference between the two groups during stage three. Slight pain reduction in the control group was attributed to the researcher being at the bedside of the participants. There were no adverse effects of this study. Delivery outcomes, as determined by delivery method and APGAR scores, were similar among the three groups. The researchers state there is limited research in the area of labor pain control and acupressure, and further studies could analyze bilateral LI4 therapy, other acupressure points, and acupressure in conjunction with conventional/pharmaceutical pain control modalities. Strengths of this study include randomized control, sample size, inclusion criterion, all the interventions in the study were performed by a single person, and similar demographics between the experimental and control groups. Weaknesses of this study included objective reporting on subjective metrics (pain), single blinding, unilateral application at LI4 due to IV placement in the other hand, and the intervention being performed by a researcher who received training, though had no prior experience in therapy; results may have been different if an acupuncture specialist with prior experience in the field had performed the acupressure.

Theme 3 – Effects of foot reflexology and foot massage on labor pain

Akköz Çevik & Incedal (2020) conducted a randomized control study on 60 participants to determine the effect of foot reflexology on labor outcomes, including labor pain, anxiety, and labor satisfaction. For this literature review, effects on labor pain will only be considered. The initial pool of participants assessed for eligibility was 342 primipara women who delivered at Gaziantep Cengiz Gokcek Maternity and Children Hospital, Gaziantep, Turkey. From the initial

pool of voluntary participants, 282 individuals were excluded from the study for not meeting study requirements, which required primiparous pregnant women, ≥19 years old, 38-42 weeks gestation, indicated for vaginal delivery, a single fetus without obstetric complications, at the beginning of the active phase of labor (4cm dilation), no maternal anomalies or systemic disease, and the ability to communicate verbally. Once the study began, there were no women who wanted to withdraw or were excluded from the final analysis (Akköz Çevik & Incedal, 2020). Participants were randomly allocated into either the intervention group (n=30) or the control group (n=30). A sample size of 27 people in each group was determined to be representative of the population. Foot reflexology was performed by a researcher under the supervision of a doctor. Data on sociodemographic information and pregnancy status was collected from the participants, with the mean statistics being recorded in the paper. This information was similar between the two groups and did not contribute to exclusion criteria. Participants were randomly assigned to one of two groups: foot reflexology massage or control group that received no therapy. Routine medical care was provided to both groups throughout the process. Labor pain was assessed in both groups during active labor (4-7cm dilation) and during the transitional phase (8-10cm dilation). Ten minutes of bilateral foot massage was performed followed by 40 minutes of reflexology on the experimental group during the active phase of labor (4-7 cm dilation). The nine reflexology pain points used in this study included Solar Plexus, Hypothalamus, Pituitary, Spleen, Thyroid Gland, Adrenal, Intestine, Spinal Cord, and Uterus/ Vagina/Ovaries/ Fallopian Tubes. This was compared to the control group, who did not receive reflexology. Pain was recorded using the Visual Analog Scale (VAS), a 0-10 scale, zero being no pain and 10 being the worst pain. Results of the study are as follows: mean pain intensity was significantly lower in the reflexology group during the active and transitional phases of labor

compared to the control ($p<.05$). The mean pain intensity during the active phase of labor in the experimental group was 4.33 ±0.76 and 9.13 ± 0.94 during the transitional phase. The mean VAS in the control group was 6.7 ± 1.09 in the active phase and 9.87 ±0.35 during the transitional phase ($p<.05$) (Akköz Çevik & Incedal, 2020). The overall conclusion by the authors of this study was that foot massage was successful at reducing labor-related pain. There were no adverse effects of this study. The finding in the massage group is similar to other studies, showing a significant reduction in labor pain. The researchers state their study suggests foot reflexology decreases overall labor pain, therefore increasing labor satisfaction and larger studies should be conducted to confirm the reliability of reflexology for labor pain control. Midwives or partners of laboring women can easily be trained in reflexology techniques and education about non-pharmaceutical pain control should be expanded (Akköz Çevik & Incedal, 2020). Strengths of this study include randomized control, sample size, pain measured multiple times during labor, inclusion and exclusion criterion, uniform positioning during the intervention, and similar demographics between the experimental and control groups. Weaknesses of this study included objective reporting on subjective metrics (pain), no pain rating reported before the intervention occurred, no comment on the specific positioning of the experimental group during therapy, no mention of the training received by the researcher performing the treatment, no mention if there was a single researcher performing therapy or multiple researchers, and the interventions being performed by a researcher who had no prior experience in therapy; results may have been different if a specialist with prior experience in the field had performed the reflexology massage.

Jameei-Moghaddam et al. (2021) conducted a randomized control study on 90 participants to determine the effects of plantar reflexology on labor pain, childbirth experience, and labor time. For the purpose of this literature review, effects on labor pain will only be

considered. The initial pool of participants assessed for eligibility was 136 women who delivered at Al-Zahra and Taleghani hospitals in Tabriz, Iran. Inclusion criteria for the study included 38-42-weeks gestation, indicated for vaginal delivery, a single fetus in vertex presentation without obstetric complications, in the latent phase of labor (3-4 cm dilated), no maternal anomalies, infertility, drug addiction, or psychological problems, no infection or barrier around the foot, no death of a loved one in the past four weeks and no analgesics four hours prior to the intervention. Exclusion criteria included a history of reflexology course, chronic illness, cutaneous disease, fracture in the area related to the intervention, or receiving other forms of non-pharmacological pain management. Of the 90 total participants, 45 women were primiparous and 45 were para 2 (Jameei-Moghaddam et al., 2021). A sample size of 27 participants in each group was determined to be representative of the population. With an estimated 10% potential attrition rate, 32 participants were randomly assigned to intervention group one, 30 to intervention group two, as well as 28 to the control group. In each group, half of the participants were primiparous, and half were para two. Foot massage and reflexology were performed by a single researcher who underwent reflexology training to control for variation. Sociodemographic and obstetric information was collected from the participants, with the mean statistics being recorded in the paper. This information was similar between the three groups. Participants were randomly assigned to one of three groups: intervention one, two 30-minute foot reflexology massages at pain control points (pituitary gland, solar plexus, uterine, and spinal cord), intervention two, one 30-minute foot massage at the pain control points and one 30-minute heel massage, or control group that received two 30-minute heel massages. The first massage was performed at 4cm dilation and the second at 7cm dilation. Labor pain was assessed in the three groups before the intervention and then one time per hour until delivery. The participants laid in the supine

position, supported by pillows during the intervention. Pain was recorded using the visual analog scale (VAS), a 0-10 scale, zero being no pain and 10 being the worst pain imaginable. Results of the study are as follows: mean pain severity before the intervention, intervention one (reflexology massage x2) 6.3 ±2.8; intervention two (one reflexology massage, one heel massage) 5.3 ±2.6; control 5.1 ±2.8 (p=0.184); mean pain severity after intervention, intervention group one 6.3 ±1.6; intervention group two 7.1 ±1.9; control 7.9 ±1.6 (p=0.003) (Jameei-Moghaddam et al., 2021). The overall conclusion by the authors of this study was that foot reflexology massage was successful at reducing labor-related pain. There were no adverse effects of this study and APGAR scores were similar amongst the three groups. The finding in the reflexology group is similar to other studies, showing a significant reduction in labor pain. The researchers state their study suggests foot reflexology massage for a longer period may be more effective in reducing labor pain since intervention group one showed better pain control than intervention group two, and both intervention groups reduced pain compared to the control. It is a low-risk intervention with easy accessibility, affordability, and trainability therefore can be utilized by a variety of populations. (Jameei-Moghaddam et al., 2021). Strengths of this study include randomized control, sample size, primiparous and para 2 participants, therapy provided and pain measured at multiple times during labor, inclusion and exclusion criterion, uniform positioning during the intervention, defined massage/reflexology techniques, therapy was performed in a quiet, controlled environment, all of the interventions in the study were performed by a single researcher to control for variation in technique, and similar demographics between the experimental and control groups. Weaknesses of this study included objective reporting on subjective metrics (pain) and the interventions being performed by a researcher who received training, though had no prior experience in therapy; results may have been different if a

specialist with prior experience in the field had performed the reflexology/massage. The intervention was performed at 4cm dilation and 7cm dilation, with pain ratings recorded hourly until delivery, but the study only reports mean severity before and after intervention, rather than the mean pain ratings at each point.

Şanli & Güngör Satilmiş (2023) conducted a randomized control study on 80 participants to determine the effects of foot massage on labor pain, labor time, postpartum bleeding, interventions, and the emotional state of the mother. According to the researchers, massage and reflexology can be effective in improving labor and delivery outcomes, but there is limited evidence available. For this literature review, effects on labor pain will only be considered. The initial pool of participants assessed for eligibility was 117 primipara women who delivered at Karaman State Hospital, a public hospital in Turkey. From the initial pool of participants, 10 individuals were excluded from the study for not meeting study requirements, which required primiparous pregnant women, ≥18 years old, 37-40 weeks gestation, indicated for vaginal delivery, a single fetus in vertex presentation without obstetric complications, in the latent phase of labor, no maternal anomalies, psychological problems or chronic disease, no edema or loss of skin integrity in the foot and ankle area, and no anesthesia or analgesics used during of labor (Şanli & Güngör Satilmiş, 2023). Eleven participants were lost to follow-up (due to cesarean section, fetal stress, prolonged labor, or analgesic/anesthesia use) and were excluded from the analysis, for a total of n=40 in the experimental group and n=40 in the control group. A sample size of 33 people in each group was determined to be representative of the population. Foot massage was performed by a single researcher who underwent 250 hours of massage training to control for variation. Data on sociodemographic information and pregnancy status was collected from the participants, with the mean statistics being recorded in the paper. This information was

similar between the two groups and did not contribute to exclusion criteria. Participants were randomly assigned to one of two groups: foot massage or control group that received no therapy. Labor pain was assessed in both groups before and after the therapy as well as at the second hour postpartum, for a total of seven VAS measurements. Classic, bilateral foot massage was performed for 20 minutes on the experimental group at cervical dilation of 4-5cm (latent phase), 6-7cm (active phase), and 8-9cm (transitional phase). Classic massage was defined as effleurage and petrissage movements. The participants laid on their left sides, supported by pillows during the intervention. This was compared to the control group, who did not receive massage, but pain ratings were recorded 30 minutes after the initial stage VAS. Pain was recorded using the visual analog scale (VAS), a 0-10 scale, zero being no pain and 10 being the most severe pain possible. Results of the study are as follows: pain increased at each VAS measurement in the control group (VAS 1-6), but mean pain intensity after treatment was significantly lower in the massage group after each intervention and postpartum (VAS 2,4,6,7). The mean pain intensity at 4-5 cm dilation in the massage group was 5.00 ±1.59 before the intervention (VAS 1) and 3.58 ± 1.72 after (VAS 2); the control group was 4.50 ±1.41 (VAS 1) and 5.50 ±1.38 (VAS 2); at 6-7 cm dilation, mean pain intensity was rated in the massage group as 6.80 ±1.20 before the intervention (VAS 3) and 5.78± 1.19 after (VAS 4); the control group was 6.75± 1.19 (VAS 3) and 7.80± 1.02 (VAS 4); at 8-9 cm dilation, mean pain intensity was rated in the massage group as 8.75± 0.84 before the intervention (VAS 5) and 7.68 ±0.97 after (VAS 6); the control group was 9.08± 0.80 (VAS 5) and 9.63± 0.59 (VAS 6). In the second hour postpartum (VAS 7), the massage group reported pain was 0.28± 0.55 versus the control group 0.90± 0.96; massage group ($p<0.001$), control group ($p<0.001$), (Şanli & Güngör Satilmiş, 2023). The overall conclusion by the authors of this study was that foot massage was successful at reducing labor-related pain at all points measured.

There were no adverse effects of this study. The finding in the massage group is similar to other studies, showing a significant reduction in labor pain. The researchers state their study suggests foot massage for a longer period may be more effective in reducing labor pain than full body massage. Participants in the massage group reported labor pain was unbearable, but foot massage provided significant relief, they were satisfied with and not bothered by the intervention, they would recommend foot massage to other women in labor and would definitely use it again in future deliveries (Şanli & Güngör Satilmiş, 2023). Strengths of this study include randomized control, sample size, therapy provided, and pain measured multiple times during labor, inclusion and exclusion criterion, uniform positioning during the intervention, defined massage technique, all of the interventions in the study were performed by a single researcher to control for variation in technique, and similar demographics between the experimental and control groups. Weaknesses of this study included objective reporting on subjective metrics (pain), no comment on the positioning of the control group, and the interventions being performed by a researcher who received training, though had no prior experience in therapy; results may have been different if a specialist with prior experience in the field had performed the massage.

Discussion

All studies reviewed in this analysis provided considerable data to support using complementary therapies such as massage, acupressure, and reflexology as effective nonpharmacologic management tools to control labor pain. Akköz Çevik & Karaduman (2019), Maghalian et al. (2022), Shahbazzadegan & Nikjou (2022), and Silva Gallo et al. (2013) all concluded massage therapy was effective at reducing labor. Pain was effectively reduced at multiple points throughout the labor process in each of the studies. The overall conclusion of Shahbazzadegan & Nikjou (2022) was that 7 cm cervical dilation is the most beneficial time to

provide massage therapy for pain reduction in labor. Gönenç & Terzioglu (2020) analyzed the effects of massage, acupressure, and massage combined with acupressure. Therapy was administered at three different points during labor, with pain ratings recorded before and after. All were effective in reducing pain compared to the control, but massage and massage plus acupressure were most successful at reducing pain at all three phases of labor. Massage was performed over a larger area of the body compared to other studies focusing therapy on the lumbar and sacral regions. Due to the dual therapies performed, pain rating gathered at three points during labor, and the larger sample size, this study was the most valuable in answering the research question. Mafetoni & Shimo, (2016) analyzed acupressure at SP6 during one point in labor. Their study included a placebo group, whose pain was reported as lower than the control group, but not as significantly as the acupressure group. All women were encouraged to perform breathing exercises. This added in a potential variable, as the researcher was providing birthing support and coaching in addition to the therapy being performed. Jameei-Moghaddam et al. (2021) concluded plantar reflexology significantly reduced labor pain and suggested the longer the therapy was administered, the more effective the technique was at reducing pain. Şanli & Güngör Satilmiş (2023) concluded similar findings and stated foot massage for longer periods may be more effective than full body massage. The women in the study reported foot massage provided significant relief, they would recommend the therapy to others, and they would use the intervention in the future. Though this is subjective data, it suggests more women would choose complementary therapies if informed about and given access to them. The participants in the studies were randomly allocated into therapy or control groups, therefore they did not have the advantage of understanding the role these therapies can play in the pain control process prior to

going into labor. Pregnant women could benefit from antenatal education on nonpharmacological pain management tools.

Sample sizes were larger in the studies performing acupressure than those analyzing massage or reflexology. Limitations in all the studies included objective analysis of a subjective metric and vast exclusion criteria. All studies were randomized control studies and methods, inclusion criteria, and demographics were similar among the studies. All studies had one researcher perform the intervention to control for variation. The studies were conducted in Turkey, Iran, and Brazil. This may suggest differences in cultural expectations of labor as well as the perception of pain during the process. Opioids and epidural anesthesia may not be as readily available in other parts of the world which may promote this type of research to be conducted in those areas as well as have willing participants in the research. There were no studies with the inclusion criteria found that were conducted in the US. This suggests a difference in the birthing environment in the US compared to other regions of the world. The high percentage of pharmacological pain control in the US may be a result of standard hospital care procedures. Even though the data strongly suggests nonpharmacological therapies can assist in labor pain control, it may be difficult to implement into obstetric care in the US. Additional research studies could be conducted utilizing complementary therapies performed by a trained professional or a member of the patient's support team, using a larger sample size, using nonpharmacological therapies in combination or with pharmacologic interventions, and therapies being performed for longer periods. Regarding the three modalities studied, there were no adverse effects, therapies were noninvasive, and there were no residual effects of treatment. These therapies can be implemented during any part of the labor process and for any length of time. The data from

several authors seems to show massage, acupressure, and reflexology are safe techniques that can be implemented during the labor process to reduce pain.

Conclusion

All studies evaluated in this analysis provided significant data to support using complementary therapies such as massage, acupressure, and reflexology as effective nonpharmacologic management tools to control labor pain. Pain was effectively reduced at multiple points throughout the labor process in each of the studies. Future research could be conducted in the US, using therapies in combination, using therapies to supplement pharmacological pain management, providing therapy for longer periods, or therapies being performed by trained professionals or by the women's support personnel. Complementary therapies are noninvasive, cost-efficient, and have no adverse or residual effects. The body of literature supports that complementary manual therapies are effective, noninvasive methods to reduce labor pain.

Application to Clinical Practice

The review of current literature allows clinical professionals to present nonpharmacologic therapies to women as effective pain management options during the labor process. Though the data strongly suggests nonpharmacological therapies can assist in labor pain control, it may be difficult to implement into obstetric care in the US as pharmacologics are the mainstay for pain control. Providing patient education on additional pain control methods and allowing complementary therapies to supplement conventional pain management might be a more probable potential.

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