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Yoga and massage therapy reduce prenatal depression and prematurity

Tiffany Field[1,2], **Miguel Diego**[1], **Lissette Medina**[1], **Jeannette Delgado**[1], and **Andrea Hernandez**[1]

[1]Touch Research Institute, University of Miami School of Medicine

[2]Fielding Graduate University

Abstract

Eighty-four prenatally depressed women were randomly assigned to yoga, massage therapy or standard prenatal care control groups to determine the relative effects of yoga and massage therapy on prenatal depression and neonatal outcomes. Following 12 weeks of twice weekly yoga and massage sessions (20 minutes each) both therapy groups versus the control group had a greater decrease on depression, anxiety and back and leg pain scales and a greater increase on a relationship scale. In addition, the yoga and massage therapy groups did not differ on neonatal outcomes including gestational age and birthweight, and those groups, in turn, had greater gestational age and birthweight than the control group.

Keywords

yoga; massage; prematurity; prenatal depression

Depression is prevalent during pregnancy, affecting 10% to 49% of women (Frisch & Riecher-Rossler, 2010; Orr, Blazer & James, 2006). Depressed women are more likely to deliver prematurely (Li, Liu, & Odouli, 2009; Mancuso, Schetter, Rini, Roesch & Hobel, 2004), and their neonates are more likely to have low birthweight (<2500 grams) (Field, Diego, Dieter, Hernandez-Reif, Schanberg, Kuhn et al., 2004; Grote, Bridge, Gavin, Melville, Iyengar, & Katon, 2010), with low birthweight being one of the leading causes of neonatal morbidity and mortality in the U.S. (MacDorman & Mathews, 2009; National Center for Health Statistics, 2006). As many as 20% of low birthweight infants experience fetal growth retardation, which continues across the first year of life (Rahman, Iqbal, Bunn, Lovel, Harrington, 2003; Westerberg, Henriksen, Ellingvag, Veierod, Juliusson, Nakstad et al., 2010). Significant morbidity and long-term health consequences associated with preterm birth and low birthweight highlight the need for research on the mechanisms underlying preterm birth and low birthweight. Studies are also needed on interventions for the management of at-risk pregnancies like prenatal depression (National Center for Health Statistics, 2006; Wen, Smith, Yang & Walk, 2004).

Correspondence and requests for reprints should be sent to: Tiffany Field, Ph.D., Touch Research Institute, University of Miami School of Medicine, PO Box 016820, Miami Florida, 33101. Business phone number (305)243-6781., tfield@med.miami.edu.

In three studies we have shown that massage therapy reduces prenatal depression and prematurity rates (Field, Hernandez-Reif, Hart, Theakston, Schanberg, Kuhn, & Burman, 1999; Field, Diego, Hernandez-Reif, Schanberg, & Kuhn, 2004; Field, Diego, Hernandez-Reif, Deeds, & Figueiredo, 2009). In the first study, pregnant women were randomly assigned to receive massage therapy or relaxation therapy for 5 weeks during the last trimester of pregnancy (Field et al., 1999). The therapies consisted of 20-minute sessions twice a week. Both groups reported lower anxiety levels after the first session and less leg pain after the first and last session. Only the massage therapy group, however, reported reduced anxiety, depression and back pain as well as better sleep by the last day of the study. The prematurity rate was significantly lower in the massage therapy group versus the relaxation control group (0% versus 17%).

In the second study, pregnant women who were depressed received a 20-minute massage at home from their significant other twice per week from 20 weeks to 32 weeks gestation (Field et al., 2004). The prenatal effects were consistent with those of the pregnancy massage for non-depressed women in the study just summarized (Field et al., 1999). Over the course of the study, the massage therapy group experienced fewer symptoms of depression, and they had lower urinary cortisol levels compared to the relaxation and standard care control groups. The massage therapy group also had fewer obstetric and postnatal complications including a lower prematurity rate (Field et al., 1999).

In the third study, pregnant women diagnosed with major depression were given 12 weeks of twice per week massage therapy by their significant other or only standard prenatal care as a control group (Field et al., 2009). The massage therapy group women versus the control group women not only had reduced depression by the end of the therapy period, but they also had reduced depression and cortisol levels during the postpartum period. Their newborns were also less likely to be born prematurely and low birthweight, and they had lower cortisol levels and performed better on the Brazelton Neonatal Behavioral Assessment habituation, orientation and motor scales (Field, et al., 2009).

Yoga has also been noted to decrease prematurity. In a prenatal yoga study, pregnant women were assigned to a yoga group or a walking group (Narendran, Nagarathna, Narendran, Gunasheela, & Nagendra, 2005). The yoga group practiced physical postures, breathing exercises and meditation from 20 weeks until delivery. More babies were born with birthweight greater than 2500 grams in the yoga group, and the incidence of preterm labor was significantly lower in the yoga group. Unfortunately, three different types of activities (postures, breathing exercises and meditation) were combined in this study, and, thus, the effects were confounded.

The purpose of the present study was to compare the effects of massage therapy, yoga postures and standard prenatal care groups of depressed pregnant women from the same clinic population. The hypothesis for this study was that yoga, by virtue of being a form of self-massage (rubbing limbs together and against the floor) (Field, 2011), was expected to have similar effects as massage on the stress measures (depression and anxiety), pain measures (leg and lower back) and neonatal outcome measures (gestational age and birthweight) assessed in this study.

Method

Participants

Two hundred eight women were screened for depression on the CES-D during their second trimester between 18 and 22 weeks at two medical school prenatal ultrasound clinics. After refusals (20%) and attrition (25%), the final sample comprised 84 depressed pregnant

women. Eligibility criteria were as follows: 1) age greater than 18 years, 2) singleton pregnancy, 3) uncomplicated pregnancy, and 4) a diagnosis of depression based on the SCID (Structured Clinical Interview for Depression). Exclusion criteria included: 1) medical illness (diabetes, HIV); 2) 40 years or older; 3) other psychiatric condition (e.g., bipolar disorder); and 4) self-reported drug use or medications that might confound the depression effects. Power analyses were based on previous massage therapy studies suggesting that a sample size of 12 per group would be required to achieve 80% power with a significance level of .05.

The women averaged 26.6 years of age, were low socioeconomic status M = 4.5 on the Hollingshead SES Index), distributed approximately 38% Hispanic, 40% African-American, and 12% Non-Hispanic White, and 71% had a partner. Fifty percent of the infants were female. The three groups did not differ on these demographic variables.

Procedures and measures

Participants were recruited at their first ultrasound assessment (M=20 weeks gestation). Following informed consent, a Research Associate screened the women for depression using the CES-D. The women were then scheduled for an assessment within that week. At the first assessment, a Structured Clinical Interview for DSM-IV Diagnoses (SCID) was conducted to determine a clinical diagnosis for depression. As in our past studies, the women were expected to be chronically depressed or at least depressed from the onset of pregnancy. The women were then randomly assigned to a yoga, massage therapy or standard prenatal care control group. All three groups received the same prenatal care.

Yoga and massage sessions—The yoga and massage sessions began after group assignment at approximately 20 weeks gestation and continued for 12 weeks until 32 weeks gestation when the second assessment was made. For the yoga sessions, a trained yoga instructor provided a 20-minute yoga routine that was designed especially for second and third trimester pregnant women with consultation from our OB/GYN collaborator (see Appendix A for routine). The yoga groups included approximately 8 women at each session. The massages were conducted by licensed massage therapists who massaged the women for 10 minutes lying on each side (total session= 20 minutes) on the head, back, legs and arms (see Appendix B for routine).

Questionnaires—In addition to the Structured Clinical Inventory for DSM IV Diagnosis (SCID), the mothers were given the following questionnaires at the prenatal assessments: 1) Sociodemograhic/Social Support Questionnaire; 2) Center for Epidemiological Studies Depression Scale (CES-D); 3) State Anxiety Inventory (STAI); 4) State Anger Inventory (STAXI); and 5) Relationship Questionnaire. All assessments were conducted by the trained research associates who were blind to the study's hypotheses and to the group assignment.

Sociodemographic/Social Support Questionnaire (Field, 2002)—The Sociodemographic/Social Support Questionnaire is comprised of items concerning age, education, occupation, income, marital status, number of children in the family, ethnicity and social support. Other questions include the use of any drugs, medications (including antidepressants and steroids) and therapies.

Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977)—This 20-item scale was included to assess symptoms of depression and was the initial screening for depression given during the first prenatal clinic ultrasound visit. The woman was asked to report on her feelings during the preceding week. The scale has adequate test/retest reliability (.60 over several weeks), internal consistency (.80-.90) and concurrent

validity (Wells, Klerman & Deykin, 1987). Test-retest reliability over a one-month period on this sample was .79, suggesting some short-term stability of depressive symptoms. A score of 16 on the CES-D is considered the cutpoint for depression (Radloff, 1991). This scale was included as a screening measure for depression and as a primary outcome variable for assessing the effects of yoga and massage therapy.

Structured Clinical Inventory for DSM-IV Diagnoses—All women in the study were administered the SCID-I at the first prenatal visit (M=20 weeks gestation) (Non-patient edition: research version) to determine depression diagnoses and to screen out other disorders including anxiety disorder, bipolar disorder, schizophrenia and other psychotic disorders. The majority (95%) of the depressed pregnant women were not taking anti-depressants and were not in psychotherapy. Most women diagnosed as depressed were chronically depressed across pregnancy and met criteria for dysthymia or major depressive disorder. The SCID was administered by the research associates following training and with continuing supervision by a clinical psychologist.

State Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1970)—This scale was included because of the comorbidity of depression and anxiety and its decrease following massage therapy. The State Anxiety Inventory is comprised of 20 items and is summarized by a score ranging from 20 to 90 and assesses how the individual feels in terms of severity (“not at all” to “very much so”). Characteristic items include “I feel nervous” and “I feel calm.” Research has demonstrated that the State Anxiety Inventory has adequate concurrent validity and internal consistency (r=.83).

State Anger (Inventory (STAXI) (Spielberger, 1988)—This is a 10-item inventory that assesses general feelings of anger based on a four-point Likert scale ranging from 1 (almost never) to 4 (almost always) and takes about 5 minutes to complete. Typical questions include “I am quick tempered” and “I fly off the handle”. Psychometric properties have been established for the STAXI on diverse ethnic groups. Test-retest reliability for this scale is 0.87. Anger was assessed because anger is often co-morbid with depression and has negative effects on fetal development and neonatal outcome (Field, Diego, Hernandez-Reif, et al, 2003).

Relationship Questionnaire (Figuereido, Field, Hernandez-Reif, & Diego, 2007)—The questionnaire is comprised of 12 items on a 4-point Likert scale and is focused on positive and negative aspects of spouse/partner relationships. The positive dimensions include a sense of support and care, as well as satisfaction, closeness and joint interests and activities, and the negative dimensions include, for example, anxiety, irritability and criticisms that have been associated with undesirable outcomes. Data for this measure were available for 95% of the sample (95% of the women being in relationships with a spouse or partner).

Birth outcome measures included gestational age at delivery and birthweight. Gestational age was determined by best obstetric estimate with a combination of last menstrual period and early uterine size and was confirmed by obstetric ultrasonographic biometry. In cases in which there was a discrepancy between last menstrual period, clinical examination and ultrasonographic biometry by more than the margin of error of ultrasonography for gestational age, the estimate of gestational age was revised according to the results of ultrasonographic biometry.

Results

Repeated measures by group ANOVAS were conducted because group by time interaction effects were expected, i.e. the two intervention groups (the massage group and the yoga group) were expected to have significantly greater reductions in depression, anxiety and pain and more optimal neonatal outcomes than the standard prenatal care group by time 2 or the end of the study. As can be seen in Table 1, the repeated measures by group ANOVAS yielded group by time interaction effects for all of the variables, suggesting significantly greater improvement for both the yoga group and the massage therapy group but not for the control group as follows: 1) decreased depression scores (F= 82.40, p<.001); 2) decreased anxiety scores (F= 26.23, p< .001); 3) decreased anger scores (F= 14.59, p<.001); 4) decreased back pain scores (F= 39.06, p<.001); 5) decreased leg pain scores (F= 19.77, p>. 001); and 6) increased relationships scores (F= 7.88, p<.001). As can be seen in table 2, between group ANOVAS revealed significantly better outcomes for the yoga group and the massage therapy group versus the standard prenatal care control group suggesting: 1) greater gestational age (F= 18.83, p<.005); and 2) greater birthweight (F= 31.52, p<.001) for the yoga group and the massage therapy group.

Discussion

The similar effects of yoga and massage therapy on prenatally depressed women are perhaps not surprising in light of the separate literatures on yoga and massage therapy, suggesting that they both lower depression and anxiety. And because massage therapy lowers back and leg pain during pregnancy (Field et al, 2004) and yoga can be considered a form of self-massage (Field, 2011), yoga might also be expected to lower back and leg pain during pregnancy.

Yoga has reportedly decreased depression (Brown & Gerbarg, 2005; Uebelacker, Tremont, Epstein-Lubow, Gaudiano, Grillette, Kalibatseva, et al, 2010), although it had not yet been shown to reduce prenatal depression until the current study. Although potential underlying mechanisms for these effects were not studied in this research, decreased depression may have contributed to decreased cortisol and, in turn, decreased prematurity. Inasmuch as cortisol and increased intrauterine artery resistance contribute to prematurity, a reduction of cortisol and intrauterine artery resistance could lead to increased gestational age (Field et al, 2004; Narendran et al, 2005). Yoga has been noted to decrease cortisol levels (Kamei, Toriumi, Kimura, Ohno, Kumano, & Kimura, 2000; West, Otte, Geher, Johnson, & Mohr, 2004), but not in prenatal depression studies, and yoga has led to decreased intratuterine artery resistance in at least one study (Narendran et al., 2005). Future research is needed on the assessment of all of these variables in a path analysis model on the same sample.

These data highlight the benefits of these cost-effective therapies for prenatally depressed women and their offspring. Inasmuch as depressed pregnant women are often reluctant to use antidepressants because of their potential side effects (Field, 2010; Van Shaick et al., 2004), massage and yoga may be cost-effective alternatives for the treatment of depression during pregnancy (Gaudiano & Epstein-Lubow, 2007), most especially if they can decrease prematurity and low birthweight, as they did in this study.

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Appendix A. Yoga Routine

Yoga Postures

Stretching from sitting on the floor position with legs crossed (straight back)

1. Spinal twist- right arm around to right, right hand on floor, left hand on right knee
2. Repeat on left side

On Hands & Knees (Stretching Back)

1. Table-pose- on hands and knees with back flat
2. Cat-pose-undulating center of back down with face up (friendly cat) and back up with face down (scared cat)

3. Kneeling balance- right arm straight forward, left leg straight back- bend leg & grab ankle with right hand
4. Repeat on opposite side
5. Kneeling warrior- Kneel on right knee, place left foot extended and perpendicular to right foot left hand straight up in the air, looking up at left hand
6. Repeat on opposite side
7. Child's pose- lying back on haunches, forearms forward on floor, forehead on forearms

Up on Knees (stretching legs)

1. "Runner's stretch"- Stretching forward with right foot on floor, both hands on right knees.
2. Repeat on left side
3. Starting up and bending at the waist, hanging down with flat hands on floor
4. Repeat on opposite side.

Standing Up (Balancing)

1. Stork-pose- One foot up high of other leg, hands in prayer position.
2. Tree-pose-right foot on left thigh or on left knee, hands raised above head in prayer position
3. Repeat with left foot
4. Eagle pose-arms intertwined in front of body, wrap one leg around other

"Sunset Salutation"

1. Start in standing prayer position
2. Swoop down to floor with prayer hands, bring hands back up and over head, slight back bend, then move hands back down to floor to support self.
3. Right foot back on floor and move left foot back on floor (into "down dog" or an inverted V position)
4. Walk feet towards hands and hands toward feet
5. Walk hands up legs into standing position
6. Then slowly up over head with prayer hands
7. Back to standing prayer position
8. Repeat on left side

Warrior Poses

1. "Warrior One"- Facing forward, right leg forward, and straight, left leg back and foot pointed to left, both arms raised parallel to floor with right hand forward, left to the back, body in straight line
2. "Warrior Two" – Moving from warrior one into warrior two, bring left arm forward and move both arms next to ears and lean forward, bending right leg

3. Repeat warrior one and two on other side moving to other side by bending over middle and relaxing with arms hanging down
4. "Triangle"- Both legs straight in a V position, right leg forward, move right hand down leg to ankle, raise left arm above head and look up to left hand
5. "Inverted triangle"- Switch arms with left hand flat on floor next to right foot and right arm above head, looking up to right hand

Seated on Floor

1. Sitting angular pose- legs out in V position, walking hands out legs
2. Cow's head pose- wrap one leg under another, move one arm up and down back and other hand back around and up back, clasp hands.
3. "Butterflies"- Seated in cross-legged position, move knees up and down with hands

Prayer Position

1. Sit with legs crossed with arms extended in prayer position above head, bring prayer hands down

Appendix B. Prenatal Massage

Head and neck: massaging the scalp, making small circles from the forehead along the hairline and down to the temples, and kneading the neck from the base up.

Back: using the heels of the hands, moving along the spine; using the palms moving the hands with rocking movements from the top of the shoulder blades to the backbone; pressing fingertips along both sides of the spine from the neck to the backbone and then stroking upward from the hips to the neck; stroking under the shoulder muscles (trapezius); inching up the back, using fingertips placed on the sides of the spine, starting from the hipbone to the neck and then reversing the direction downward using fingertips in a raking fashion; massaging the lower back from the backbone across the waistline using the heels of the hands to make large circles; long gliding strokes from the hip up and over the shoulders.

Arms: making long sweeping strokes from the elbow up and over the shoulder; kneading the muscles from above the elbow to the shoulder; stroking from the wrist to the elbow; kneading the muscles between the wrist and the elbow.

Legs: long sweeping strokes from the knee to the thigh, up and over the hip; kneading the muscles between the knee and thigh; long sweeping strokes from the ankle up toward the knee; kneading the muscles between the ankle and knee; sliding the hand from the Achilles tendon up towards the upper calf and sliding down to the heel with less pressure several times.

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Table 1

Means for prenatal self-report measures for first and last treatment days for yoga, massage therapy and control groups (standard deviations in parentheses). [1]

	Yoga		Massage		Control	
	1st day	Last day	1st day	Last day	1st day	Last day
Depression (CES-D)	28.35(8.86)	20.12 (10.51)	24.08 (6.22)	12.31 (4.89)	22.65 (6.99)	19.27 (10.12)
Anxiety (STAI)	50.00 (10.32)	42.60 (8.85)	44.19 (9.83)	36.58 (6.88)	42.38 (10.31)	38.96 (9.11)
Anger (STAXI)	22.00 (7.44)	18.16 (6.26)	18.80 (4.92)	16.64 (4.16)	20.10 (10.25)	19.00 (5.04)
Back pain	4.17 (2.26)	2.75 (2.19)	5.65 (1.86)	3.25 (2.74)	4.85 (2.43)	5.27 (2.41)
Leg pain	2.58 (2.54)	1.63 (1.76)	4.02 (2.40)	1.77 (1.99)	3.46 (2.23)	4.38 (2.95)
Relationships	.35 (1.27)	.87 (1.24)	.72 (.97)	1.28 (.72)	.73 (1.14)	.66 (.90)

[1] Yoga and massage therapy groups experienced significant changes on all variables at $p < .001$. Control group changes were not significant.

Table 2

Means for neonatal outcome data (standard deviations in parenthesis).[1]

	Yoga	Massage	Control
Gestational age	38.63 (1.91)	38.43 (1.94)	36.73 (2.55)
Birthweight	3221.92 (514.48)	3131.22 (518.76)	2931.77 (539.34)

[1] Yoga and massage groups significantly differed from the control group on these neonatal variables.