Published in final edited form as:

Complement Ther Clin Pract. 2013 February ; 19(1): 6–10. doi:10.1016/j.ctcp.2012.10.001.

Tai chi/yoga reduces prenatal depression, anxiety and sleep disturbances

Tiffany Field^{a,b,*}, Miguel Diego^a, Jeannette Delgado^a, and Lissette Medina^a

Tiffany Field: tfield@med.miami.edu

^aTouch Research Institute, University of Miami Medical School, United States

^bFielding Graduate University, United States

Abstract

Ninety-two prenatally depressed pregnant women were randomly assigned to a tai chi/yoga or a waitlist control group at an average of 22 weeks gestation. The tai chi/yoga group participated in a 20-min group session per week for 12 weeks. At the end of the treatment period the tai chi/yoga group had lower summary depression (CES-D) scores, as well as lower negative affect and somatic/vegetative symptoms subscale scores on the CES-D, lower anxiety (STAI) scores and lower sleep disturbances scores.

Keywords

Tai chi/yoga; Prenatal depression; Anxiety; Sleep

1. Prenatal depression

Prenatal depression has been noted to affect as many as 49% of pregnant women, with ethnic minorities,^{1,2} lower income and unmarried women being at greater risk.³ Prenatal depression is a risk factor for prematurity,¹ for developmental delays,⁴ and for later behavior problems in childhood⁵ and adolescence.⁶ These problems highlight the need for prenatal interventions.

2. Traditional therapies

Traditional treatments for depression have been underutilized in the case of prenatal depression for various reasons. For example, antidepressants have been used by a very small percentage (1–5%) of prenatally depressed women because of the mixed data on fetal and neonatal outcomes.^{7,8} Different forms of psychotherapy including cognitive behavior therapy have also had mixed effects^{9,10} in addition to being unaffordable by most women.¹⁰

3. Alternative therapies

Alternative therapies including massage therapy and yoga have been notably effective. For example, moderate pressure massage therapy has decreased prenatal depression,¹ as well as prematurity.¹¹ However, unless partners are willing to massage pregnant women, it can be a

costly therapy. Yoga has the advantages of being more affordable and being transportable, for example, being learned and practiced with a DVD.

4. Yoga

Positive effects of yoga have been reported for pregnant women, including less stress, anxiety and pain across pregnancy,¹² less pregnancy discomfort,¹³ and less painful labor as well as less time in labor.¹⁴ When yoga was compared to walking, complications like pregnancy-induced hypertension with associated intrauterine growth retardation were less frequent in the yoga group as well as the incidence of preterm labor and Cesarean delivery.¹⁵ Doppler abnormalities were also reduced including uterine artery resistance which would limit transport of oxygen and nutrients to the fetus and lead to intrauterine growth delays and lower birthweight. Unfortunately, however, it is not clear whether the benefits derived from the physical postures, the breathing, the meditation and/or all the components of the yoga sessions. In addition, the women's postures were limited by the time they reached the third trimester because of clumsiness and balance problems as the fetus grew larger. Other forms of moderate exercise, like tai chi, might be explored for a third trimester form of exercise when yoga postures are more difficult to perform because of the increasingly large fetus.

5. Tai chi

Curiously, although balance and the potential risk of falling are great concerns during pregnancy,¹⁶ and given that tai chi is one of the most effective forms of exercise for balance, it is surprising that no studies could be found on tai chi with pregnant women. The most frequently reported benefits for tai chi in other samples are increased balance¹⁷ and fewer falls.^{18,19} In one study, based on kinematic analysis, the tai chi practitioners used a more cautious walking strategy including slower gait and shorter and slower steps than the control subjects.²⁰

Research on non-pregnant adults also suggests that tai chi decreases anxiety and stress.^{21,22} Other pregnancy-related problems that were reduced by tai chi in non-pregnant samples included depression and sleep disturbances.^{23,24} The relaxation-inducing effects of tai chi are shown by brain waves changing in the direction of heightened alertness and relaxation.²⁵ In the Liu et al.²⁵ study, higher beta power was noted along with higher alpha power on EEGs (the pattern noted during attentiveness). Further, physiological and biochemical effects have included decreased systolic and diastolic blood pressure and reduced cholesterol.^{26,27} It was not surprising in this study that when cholesterol levels decreased, either low density lipoprotein decreased or high density lipoprotein increased (both positive effects).²⁶

6. Tai chi and yoga combined

Interestingly, tai chi has not been compared to yoga or exercise and has not even been studied by itself with pregnant women, although it may be the optimal form of exercise for pregnant women, especially in the third trimester when other more rigorous forms of exercise are being discouraged. Tai chi and yoga combined may be an optimal form of exercise for pregnant women to target balance and to achieve the positive effects noted for stretching as well as to maintain moderately aerobic exercise across pregnancy.

7. Present study

The current study was suggested by the literature on tai chi in non-pregnant women and yoga with pregnant women and our pilot data showing positive effects of combining tai chi

and yoga for pregnant women including decreased anxiety and depressed mood. The short routine (15 min) that combines balance exercises of tai chi along with a short tai chi form and stretching exercises of yoga is a cost-effective program that could be practiced on a daily basis with a high degree of compliance.²⁸ The routine is also interesting in that it combines several tai chi exercises and yoga poses that are appropriate for pregnant women, consistent with the previous studies conducted on yoga with pregnant women. The purpose of the present study was to explore the effects of this brief tai chi/yoga routine on prenatal depression. The effects of this routine on anxiety and sleep disturbance were also explored because both anxiety and sleep disturbances have been notably comorbid with prenatal depression.²⁹

8. Method

8.1. Participants

The sample was comprised of 92 participants recruited from two prenatal ultrasound clinics affiliated with a large university medical center in the South. The participants were clinically depressed pregnant women who were randomly assigned to either a tai chi/yoga treatment ($n = 46$) or a control group ($n = 46$) (See recruitment diagram). The recruitment criteria were: (1) meeting diagnostic criteria for depression on the Structured Clinical Interview for Depression (SCID); (2) being pregnant with one child; (3) having an uncomplicated pregnancy with no medical illness; (4) being younger than 40 years-old; and (5) not using drugs (i.e., prescribed or illicit). Previous samples recruited from these clinics had a very low incidence (3–5%) of treatment for prenatal depression (i.e., psychotherapy or antidepressants), so these were not exclusion criteria.

The sample consisted of women ranging in age from 18 to 37 years-old, with an average age of 26.6 years ($SD = 5.5$). The participants were primarily low income minorities who had a high school education. Table 1 provides group means for the women's age, education, SES, ethnicity and marital status.

8.2. Procedures

Women in the tai chi/yoga group participated in a 20 min session per week for a period of 12 weeks. A trained yoga instructor led group participants through a routine specifically designed for women in their second and third trimester of pregnancy. The waitlist control group participated in tai chi/yoga classes at the end of the tai chi/yoga treatment period. The yoga and waitlist control groups were the same size and followed the same weekly schedule. Participants in both groups were paid \$20 for each session to compensate for expenses related to childcare and transportation. The assessments were conducted at 22 weeks gestation at the beginning of the treatment period, and at 34 weeks gestation at the end of the treatment period.

8.3. Measures

8.3.1. Structure clinical interview for depression (SCID)—All women in the study were given the SCID (research version) at the beginning of the study to determine depression and anxiety diagnoses and to screen out other disorders including bipolar disorder, schizophrenia and other psychotic disorders. The women were diagnosed with dysthymia or major depression on the SCID based on DSM IV symptoms. The SCID was given by a research associate following training and with continuing supervision by a clinical psychologist.

8.3.2. The center for epidemiological studies-depression scale (CES-D)³⁰—The CESD-D was administered at the beginning ($M = 20$ weeks gestation) and at the end of the

treatment period ($M = 32$ weeks gestation). The CES-D is a 20-item self-report measure that assesses frequency of current depressive symptoms over the past week.³⁰ Targeted symptoms include “depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, loss of energy, and disturbances of sleep and appetite”.³¹ Likert frequency ratings include most of the time (6–7 days), occasionally (3–4 days), some of the time (1–2 days), and rarely (less than a day). Individuals are asked to rate each item from 0 to 3 based on how often they have felt this way, with higher scores indicating greater frequency. Total summary scores range from 0 to 60, with clinical levels of depressive symptomatology being associated with scores of 16 or higher.³⁰ Subscale scores are provided for depressed affect, positive affect, somatic/vegetative signs, and interpersonal distress.³¹ The CES-D has acceptable validity and reliability for various demographic variables, including geographic location, level of education, age, race, and ethnicity (black, White, Hispanic, Asian and European), and language.³¹

A study on a high-risk sample of women with antepartum depression revealed internal consistency (Cronbach alpha) ranging from .88 to .93.³² Additionally, test–retest reliability indicated stable results over time (i.e., at admission, 2 weeks, and 4 weeks), as well as statistically significant ($p > .01$) convergent validity with other depression symptom scales.³² CES-D scores were also sensitive to decreases in depression symptoms resulting from massage therapy.^{11,33} Together these findings suggested that the CES-D was an appropriate measure of depression symptoms for this study's sample and design.

8.3.3. The state anxiety inventory (STAI)—Is comprised of 20 items assessing the intensity of anxiety symptoms.³⁴ Scores range from 20 to 90, and the cut-off for high anxiety is 48. Research has demonstrated that the STAI has adequate concurrent validity and internal consistency, and the scale has been used in several studies with pregnant women.³⁵

8.3.4. Sleep disturbances—Questions on this 15-item scale are rated on a visual analog anchored at one end with effective sleep responses (e.g., “Did not awaken,” “Had no trouble sleeping”) and at the opposite end with ineffective sleep responses (e.g., “Was awake 10 h,” “Had a lot of trouble sleeping/falling asleep”).³⁶ The participants place a mark across the answer line at the point that best reflects their last night's sleep. A reliability coefficient of .82 has been reported for this scale.³⁶ The sleep disturbance subscale was used in this study.

9. Results

As can be seen in Table 1, ANOVAS conducted on demographic variables revealed; (1) no group differences on mother's age; (2) lesser education in the tai chi/yoga group; and (3) lower SES in the tai chi/yoga group. Chi Square tests revealed no differences on the ethnicity distribution and marital status of the two groups of women.

Repeated measures group by treatment session ANOVAS were conducted with treatment session as the repeated measure. As can be seen in Table 2, group by treatment session interaction effects were noted, suggesting that the tai chi/yoga showed greater decreases in their scores across the treatment period on; (1) depression including CES-D summary, CES-D affect and CES-D somatic/vegetative subscales; (2) anxiety on the STAI scale; and (3) sleep disturbances on the Snyder-Halpern and Verran scale.

10. Discussion

That greater decreases were noted in depression, anxiety and sleep disturbances across the treatment period for the tai chi/yoga group is perhaps not surprising. Yoga has contributed to positive effects for pregnant women including reductions in stress and pain across

pregnancy¹² as well as pregnancy discomfort.¹³ These effects would be expected to lead to the decreased depression and sleep disturbances noted in our study. The reduction in anxiety in our depressed pregnant women sample is consistent with the reduction in anxiety already reported in a non-depressed pregnant women sample.¹² The decreased depression, anxiety and sleep disturbances noted in our study are also consistent with tai/chi studies showing decreased anxiety^{21,22} and decreased depression and sleep disturbances following tai chi^{23,24} but in non-depressed, non-pregnant samples.

Increased vagal activity following yoga may account for these effects. When pregnant women were randomly assigned to yoga, deep relaxation or standard prenatal exercise groups, stress decreased by 32% in the yoga group and increased by 7% in the control group.³⁷ Heart rate variability or vagal activity increased in the yoga group from baseline by 64% in the 20th week gestation and by 150% in the 36th week, suggesting increased relaxation. The low-frequency band of heart rate (a measure of stress) was also decreased after deep relaxation at the 36th week in the yoga group. However, that vagal activity increased suggests that pregnancy-related stress may be significantly reduced by yoga which, in turn, would likely lead to lower depression, anxiety and sleep disturbances. These data and the research showing that yoga has more positive effects than walking¹⁵ suggest that yoga may be an effective exercise for pregnant women, especially when lower impact exercise is indicated as pregnancy progresses.

Heart rate has also decreased²⁷ and vagal activity has increased following tai chi.^{38,39} In a meta-analysis on tai chi studies, aerobic capacity was significantly greater for practitioners in at least seven studies.⁴⁰ These variables need to be assessed in depressed pregnant samples to determine whether increased vagal activity may be a potential underlying mechanism. Further, flat facial expressions and limited vocal intonation may occur in depressed individuals due to low vagal activity.⁴¹ If vagal activity was increased following tai chi/yoga, facial and vocal expressivity might also increase, suggesting that they too might be assessed in future studies.

Further research comparing tai chi and yoga also is needed on depressed pregnant women especially in the third trimester when tai chi may be a more effective form of exercise. And, the most important outcome effects for tai chi/yoga may be a reduced incidence of prematurity and low birthweight, highlighting the importance of measuring these outcomes in future studies on tai chi/yoga with depressed pregnant women.

Acknowledgments

We would like to thank those who participated in our studies. This research was supported by an NIH grant (HD056036) and a Senior Research Scientist Awards (AT001585) and funding from Johnson & Johnson Pediatric Institute to the Touch Research Institute.

References

1. Field T, Diego M, Hernandez-Reif M, Deeds O, Holder V, Schanberg S, et al. Depressed pregnant black women have a greater incidence of prematurity and low birthweight outcomes. *Infant Behavior and Development*. 2009; 32:10–6. [PubMed: 19004502]
2. Gavin AR, Melville JL, Rue T, Guo Y, Dina KT, Katon WJ. Racial differences in the prevalence of antenatal depression. *General Hospital Psychiatry*. 2011; 33:87–93. [PubMed: 21596200]
3. Lancaster CA, Gold KJ, Flynn HA, Yoo H, Marcus SM, Davis MM. Risk factors for depressive symptoms during pregnancy: a systematic review. *American Journal of Obstetrics and Gynecology*. 2010; 202(1):5–14. [PubMed: 20096252]

4. Deave T, Heronm J, Evans J, Edmond A. The impact of maternal depression in pregnancy on early child development. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2008; 115:1043–51. [PubMed: 18651886]
5. de Bruijn ATCE, van Bakel HJA, van Baar AL. Sex differences in the relation between prenatal maternal emotional complaints and child outcome. *Early Human Development*. 2009; 85:319–24. [PubMed: 19162414]
6. Hay DF, Pawlby S, Waters CS, Perra O, Sharp D. Mothers' antenatal depression and their children's antisocial outcome. *Child Development*. 2010; 81:149–65. [PubMed: 20331659]
7. Einarson A, Choi J, Einarson TR, Koren G. Adverse effects of antidepressant use in pregnancy: an evaluation of fetal growth and preterm birth. *Depression and Anxiety*. 2010; 27:35–8. [PubMed: 19691030]
8. Field T. Prenatal depression and selective serotonin reuptake inhibitors. *International Journal of Neuroscience*. 2010; 120:163–7. [PubMed: 20374082]
9. Butler AC, Chapman JE, Forman EM, Beck AT. The empirical status of cognitive-behavioral therapy: a review of meta-analyses. *Clinical Psychology Review*. 2006; 26:27–31.
10. Parker G, Crawford J, Hadzi-Pavlovic D. Quantified superiority of cognitive behavior therapy to antidepressant drugs: a challenge to an earlier meta-analysis. *Acta Psychiatrica Scandinavica*. 2008; 118:91–7. [PubMed: 18452571]
11. Field T, Diego M, Hernandez-Reif M, Figueiredo B, Schanberg S, Kuhn C. Massage therapy effects on depressed pregnant women. *Journal of Psychosomatic Obstetrics and Gynaecology*. 2004; 25:115–22. [PubMed: 15715034]
12. Beddoe AE, Paul Yang CP, Kennedy HP, Weiss SJ, Lee KA. The effects of mindfulness based yoga during pregnancy on maternal psychological and physical distress. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*. 2009; 38:310–9.
13. Sun YC, Hung YC, Chang Y, Kuo SC. Effects of a prenatal yoga programme on the discomforts of pregnancy and maternal childbirth self-efficacy in Taiwan. *Midwifery*. in press.
14. Chuntharapat S, Petpichetchian W, Hatthakit U. Yoga during pregnancy: effects on maternal comfort, labor pain and birth outcomes. *Complementary Therapies in Clinical Practice*. 2008; 14:105–15. [PubMed: 18396254]
15. Narendran S, Nagarathna R, Gunasheela S, Nagendra HR. Efficacy of yoga in pregnant women with abnormal Doppler study of umbilical and uterine arteries. *Journal of the Indian Medical Association*. 2005; 103:12–4. 16–17. [PubMed: 16008324]
16. American College of Obstetricians and Gynecologist. Exercise during pregnancy and the postpartum period. *Clinical Obstetrics and Gynecology*. 2003; 46:496–9. [PubMed: 12808399]
17. Wu G, Keyes L. Group tele-exercise for improving balance in elders. *Telemedicine Journal and E-Health*. 2006; 12:561–70. [PubMed: 17042710]
18. Lin M, Hwang H, Wang Y, Chang S, Wolf S. Community-based Tai Chi and its effects on injurious falls, balance, gait and fear of falling in older people. *Physical Therapy*. 2006; 86:1189–201. [PubMed: 16959668]
19. Maciaszek J, Osinski W, Szeklicki R, Stemplewski R. Effects of Tai Chi on body balance: randomized controlled trial in men with osteopenia or osteoporosis. *American Journal of Chinese Medicine*. 2007; 35:1–9. [PubMed: 17265545]
20. Ramachandran A, Rosengren K, Yang Y, Hsiao-Weckslar E. Effect of Tai Chi on gait and obstacle crossing behaviors in middle-aged adults. *Gait Posture*. 2007; 26:248–55. [PubMed: 17035021]
21. Taylor-Piliae R, Haskell W, Waters C, Froelicher E. Change in perceived psychological status following a 12-week Tai Chi exercise programme. *Journal of Advanced Nursing*. 2006; 54:313–29. [PubMed: 16629916]
22. Wang Y, Taylor L, Pearl M, Chang L. Effects of Tai Chi exercise on physical and mental health of college students. *American Journal of Chinese Medicine*. 2004; 32:453–9. [PubMed: 15344428]
23. Li F, Fisher K, Harmer P, Irbe D, Tarse R, Weimer C. Tai Chi and self-rated quality of sleep and daytime sleepiness in older adults: a randomized controlled trial. *Journal of the American Geriatric Society*. 2004; 5:892–900.
24. Wall R. Tai Chi and mindfulness-based stress reduction in a Boston Public Middle School. *Journal of Pediatrics and Health Care*. 2005; 19:230–7.

25. Liu Y, Mimura K, Wang L, Ikuda K. Physiological benefits of 24-style Taijiquan exercise in middle-aged women. *Journal of Physiology and Anthropology Applied Human Science*. 2003; 22:219–25.
26. Ko GT, Tsang PC, Chan HC. A 10-week Tai Chi program improved the blood pressure, lipid profile and SF-36 scores in Hong Kong Chinese women. *Medical Science Monitor*. 2006; 12:196–9.
27. Wolf S, O'Grandy M, Easley K, Guo Y, Kressig R, Kutner M. The influence of intense Tai Chi training on physical performance and hemodynamic outcomes in transitionally frail older adults. *Journal of Gerontology: A Biological Science and Medical Science*. 2006; 61:184–9.
28. Field T, Diego M, Hernandez-Reif M, Medina L, Delgado J, Hernandez A. Yoga and massage therapy reduce prenatal depression and prematurity. *Journal of Bodywork & Movement Therapies*. 2012; 16:204–9. [PubMed: 22464118]
29. Field T, Diego M, Hernandez-Reif M, Figueiredo B, Schanberg S, Kuhn C. Sleep disturbances in depressed pregnant women and their newborns. *Infant Behavior and Development*. 2007; 30:127–33. [PubMed: 17292785]
30. Radloff L. The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Methods*. 1977; 1:385–401.
31. Radloff L, Terri L. Use of the center for epidemiological studies-depression scale with older adults. *Clinical Gerontologist*. 1986; 5:119–35.
32. Maloni JA, Park S, Anthony MM, Musil CM. Measurement of antepartum depressive symptoms during high-risk pregnancy. *Research in Nursing & Health*. 2005; 28:16–26. [PubMed: 15625706]
33. Field T, Hernandez-Reif M, Hart S, Schanberg S, Kuhn C. Pregnant women benefit from massage therapy. *Journal of Psychosomatic Obstetrics and Gynaecology*. 1999; 20:31–8. [PubMed: 10212885]
34. Spielberger, CD.; Gousch, TC.; Lushene, RE. The state trait anxiety inventory (STAXI). Palo Alto, CA: Consulting Psychologists Press; 1970.
35. Da Costa D, Larouche J, Dritsa M, Brender W. Psychological correlates of prepartum and postpartum depressed mood. *Journal of Affective Disorders*. 2000; 59:31–40. [PubMed: 10814768]
36. Snyder-Halpern R, Verran JA. Instrumentation to describe subjective sleep characteristics in healthy subjects. *Research in Nursing Health*. 1987; 10:155–63. [PubMed: 3647537]
37. Satyapriya M, Nagendra HR, Nagarathna R, Padmalatha V. Effect of integrated yoga on stress and heart rate variability in pregnant women. *International Journal of Gynecology and Obstetrics*. 2009; 104:218–22. [PubMed: 19110245]
38. Lu W, Kuo C. Comparison of the effects of tai chi chuan and wai tan kung exercises on autonomic nervous system modulation and on hemodynamics in elder adults. *American Journal of Chinese Medicine*. 2006; 34:959–68. [PubMed: 17163585]
39. Motivala S, Sollers J, Thayer J, Irwin M. Tai Chi acutely decreases sympathetic nervous system activity in older adults. *Journal of Gerontology and Biological Science and Medical Science*. 2006; 61:1177–80.
40. Taylor-Piliae R, Froelicher E. Effectiveness of Tai Chi exercise in improving aerobic capacity: a meta-analysis. *Journal of Cardiovascular Nursing*. 2004; 19:48–57. [PubMed: 14994782]
41. Porges SW. The polyvagal theory: phylogenetic substrates of a social nervous system. *International Journal of Psychophysiology*. 2001; 42(2):123–46. [PubMed: 11587772]

1. . Recruitment Diagram

Table 1

Means (and standard deviations in parentheses) on demographic variables for depressed waitlist control and tai chi/yoga groups.

Variable	Group		<i>p</i>
	Control	Tai Chi/Yoga	
Mothers			
• Age	26.0 (5.6)	24.4 (4.7)	NS
• Education	4.4 (1.3)	3.8 (4.1)	.02
• SES	4.0 (1.1)	4.7 (.9)	.001
Ethnicity (%)			NS
• Hispanic	57.0	60.0	
• African-American	40.0	38.0	
• Non-Hispanic White	3.0	2.0	
Marital status (9%)			NS
• Single	30.0	40.0	
• Boyfriend	49.0	46.0	
• Married	21.0	14.0	

Table 2

Mean scores (and standard deviations in parentheses) on depression, anxiety and sleep disturbance variables for depressed waitlist control and tai chi/yoga groups at beginning and end of study.

Variable	Group				<i>p</i>
	Control		Tai chi/yoga		
	First day	Last day	First day	Last day	
Depression (CES-D)	26.7 (11.2)	23.9 (11.4)	32.4 (10.2)	23.5 (9.0)	.001
• Affect subscale	7.2 (3.9)	6.7 (4.5)	9.5 (3.7)	6.3 (3.5)	.001
• Somatic/vegetative subscale	8.6 (4.6)	7.6 (3.7)	10.5 (3.7)	7.4 (3.4)	.01
Anxiety (STAI)	47.3 (12.7)	44.3 (11.4)	54.2 (9.2)	46.1 (7.9)	.01
Sleep disturbances	54.4 (19.7)	62.1 (18.4)	56.6 (20.1)	53.5 (19.5)	.05