The Effects of Pilates and Progressive Muscle Relaxation Therapy on Maternal Stress and Anxiety: a Literature Review

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Abstract

Mother and baby may experience harmful maternal stress and anxiety. Complementary and alternative methods can be used to reduce these conditions during pregnancy. This literature review pertains to the effects of Pilates and progressive muscle relaxation therapy on maternal stress and anxiety. A descriptive analysis was taken on 4475 articles, 4461 articles proved unsuitable, and 14 articles were ultimately included. Limited research has been undertaken regarding the value of Pilates and progressive muscle relaxation therapy in reducing stress and anxiety. Therefore there is much scope for further enquiry. Progressive muscle relaxation therapy can reduce stress and anxiety during pregnancy.

Key Words: Pregnancy, Pilates, progressive muscle relaxation therapy, stress, anxiety, literature review

1. Introduction

Pregnancy can increase stress and anxiety in a woman's life (Talley, 2013). Stressors include expectations surrounding the pregnancy, the woman's changing body, concern for the health of the baby, and the experience and uncertainty of becoming a new mother (Calumet, 2013). Both the mother and the baby can benefit from a strategy that alleviates some of the additional stress at this time (Calumet, 2013). Stress is a broad term that includes any factor – mental, physical or social – that challenges homeostasis (Odendaal, Groenewald & Bavanisha, 2011). Anxiety is a form of distress related to the anticipation of an unknown or threatening situation that encompasses feelings, thoughts, physical responses and behaviors (Odendaal et al., 2011). Both these conditions are common in many pregnancies (Odendaal et al., 2011).

South African women have some of the highest global rates of antenatal depression, compounded by psychosocial stressors such as poverty and traumatic stress (Odendaal et al., 2011). Where stress and anxiety are experienced in the course of pregnancy, elevated levels of postpartum depression and mood disorders (Grant, McMahon & Austin, 2008), an increased risk of premature delivery, low birth weight (Orr, Reiter, Blazer & James, 2007) and poor fetal growth (Odendaal et al., 2011) can be seen. Pregnant women with elevated levels of stress and anxiety may be more likely to report physical illnesses as well as somatic symptoms such as headaches, stomach pain, dizziness, shortness of breath, heart palpitations, and nausea (Kelly, Russo & Katon, 2001). If an expectant woman experiences mild anxiety, non-pharmacological treatment can be taken by focusing on her diet, the quality of her sleep, psychotherapy, physical exercise and methods of relaxation (Atwood, 2013). Pilates and progressive muscle relaxation therapy (MRT) are two relatively unconventional courses of treatment that offer alternatives to established therapies to address anxiety or stress-related discomfort experienced during pregnancy. Pilates is a form of exercise encompassing both the mind and body that requires attentive breathing, muscle control, posture, core stability, strength, and flexibility (Wells, Kolt & Bialocerkowski, 2012).

Pilates was invented by Joseph Hubertus Pilates who, at the age of 14, dedicated his life to physical fitness, having overcome his childhood illnesses, which included asthma, rheumatic fever, and rickets (Balogh, 2005). It was originally named 'contrology' and was inspired by a variety of techniques drawn from meditation, martial arts, gymnastics, and yoga (Balogh, 2005). Pilates first consisted of 34 mat-based exercises, but has since expanded to include other equipment in order to assist beginners with more difficult exercises (Balogh, 2005). Pilates can prevent numerous problems associated with pregnancy (Balogh, 2005). According to Balogh (2005) it is a gentle form of exercise and can be performed with the subject sitting or lying on the side of her body when a supine position is contraindicated during the second- and third trimesters. Prenatal Pilates is considered to be an ideal exercise choice for pregnant women because it is a low-impact mind–body exercise that offers emotional, mental, and physical benefits (Dillard, 2013). Cruz-Ferreira et al. (2011) found that women participating in Pilates presented with improved self-concept and health perceptions and were more satisfied with their lives than others. According to Swann (2009), stress and tension can also be alleviated by practicing Pilates. The aforementioned study's results further correlate with those produced by Adams, Caldwell, Atkins and Quin (2012), who found that Pilates assists in the creation of a positive mental attitude that leads to better stress management. Moreover such exercises can prevent a number of difficulties associated with pregnancy such as biomechanical changes that can lead to back, neck, and shoulder pain (Balogh, 2005).

MRT is equally non-invasive, cost-effective, and easily applicable during pregnancy (Chuang et al., 2012). According to Conrad and Roth (2007), MRT can yield a significant reduction in the distress and functional impairments associated with certain kinds of anxiety. Progressive MRT involves tensing a muscle and then releasing that tension (Conrad & Roth, 2007); it is based on the therapeutic claim that people who experience stress and anxiety have tensed muscles and that by learning how to reduce this tension they can find relief from their distress both in mental and physical terms (Conrad & Roth, 2007). Bernstein and Borkovec (1973) authored a detailed manual for progressive relaxation training, allowing researchers and therapists to standardize the procedure. The manual takes the following approach to progressive MRT: the client learns to focus their attention on the muscle group that is tense and then further tenses that muscle group upon instruction from the therapist, maintaining the tension for 5–7 seconds, and then relaxing the muscle group following a cue. As the muscles relax, the subject is asked to focus on the feelings associated with this relaxation (Bernstein &Borkovec, 1973).

In a 10-year systematic review by Manzoni, Pagnini, Castelnuovo and Molinari (2008), relaxation training has proved consistently and significantly effective in the reduction of anxiety. While all relaxation training techniques reduce anxiety, meditation, applied relaxation, and progressive relaxation have been shown to have the greatest effects (Manzoni et al., 2008). In as little as 20 minutes the effects of progressive MRT can be seen in the increased levels of relaxation as well as in reduced levels of stress and of perceived stress (Pawlow& Jones, 2002). Progressive MRT is easy to teach and to learn, it is safe, non-competitive, and non-threatening (Smith, Hancock, Blake-Mortimer & Eckert, 2007). However, the potential benefits of Pilates and MRT in pregnancy – although assumed to be many and not in dispute – have not been reported in the literature, which is the reason for us undertaking the review reported here. Furthermore this literature review forms part of a larger original study that focuses on Pilates and progressive MRT.

2. Method

2.1 Study design

A literature review was conducted to investigate the available literature on the possible benefits of Pilates and progressive MRT as stress and anxiety reducing interventions during pregnancy. The review used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) flowchart (Moher, Liberati, Tetzlaff & Altman, 2009) to identify articles for inclusion (Appendix A). The online reference system was EBSCO *host*, the databases of which are Academic Search complete, Health Source–Nursing, MEDLINE, Nursing Reference Centre, Sport Discus, and Google Scholar.

2.2 Search strategy

A search for the featured word combination of "pregnancy AND Pilates OR relaxation therapy AND stress OR anxiety" was undertaken in the literature published between 2005 and 2015. The following limits or criteria were applied to the database search in order to identify papers published in peer-reviewed journals in English: the titles, abstracts, and the full texts of papers were examined to determine the suitability of inclusion against selection criteria.

The only papers that were deemed suitable for inclusion in this literature review were those that dealt with randomized and case control trials. The references to papers that were found to meet these criteria were subsequently searched for further relevant articles that had not previously been identified. The following additional information was extracted from the articles selected: the author and year of publication, the population, the type and duration of the intervention, the number of participants, their age (mean and standard deviation), and the main findings of the studies.

3. Results

Articles meeting inclusion criteria were descriptively analyzed and the data were expressed in a table format (Appendix B). Database searches identified 4475 full-text articles, and a secondary search of the reference lists of these papers identified an additional 5 articles. Papers were excluded in so far as they were either review articles (n = 51), not written in English (n = 1194), not published in a peer-reviewed academic journal (n = 2140), duplicates (n = 6) or did not specifically investigate the effects of Pilates or progressive MRT on stress and anxiety during pregnancy (n = 1075). Ultimately, 14 papers were included in the literature review.

Not a single study was found that was centered on both the effects of Pilates and of progressive MRT on stress and anxiety levels during pregnancy, although Guszkowska, Sempolska, Zaremba and Langwald (2013a) compared the effects of exercise with elements of Pilates and of progressive MRT. No papers reported on the effects of Pilates on stress and anxiety during pregnancy; moreover, no studies at all had been conducted on the effects of Pilates on any variable during pregnancy. However, several investigations on the positive effects of yoga on stress and anxiety during pregnancy were found (Bonura, 2014; Bribiescas, 2013; Li & Goldsmith, 2012; Narendran; Rakhshani, Maharana, Raghuram, Nagendra & Venkatram, 2010). Pilates and yoga are similar exercise regimes that focus on breath control and assist in the maintenance of supple, stretched and aligned limbs (Haspel, 2005).

Two studies were conducted on pregnant women, during their 2nd and 3rd trimesters, in which exercise combined with elements of Pilates were used as an intervention program. Eleven articles were found on the effects of progressive MRT on stress and anxiety during pregnancy. Five of these studies focused on the effects that progressive MRT has on stress and anxiety during pregnancy (Alder, Urech, Fink, Bitzer & Hoesli, 2011; Urech et al., 2010; Teixeira, Martin, Prendiville& Glover, 2005; Bastani, Hidarnia, Kazemnejad, Vafaei & Kashanian, 2005; Tragea et al., 2014): one study researched the influence of progressive MRT on the birth experience (Gedde-Dahl &Fors, 2012), four studies selected pregnant women with a medical condition related to pregnancy (Chuang et al., 2012; Pan, Zhang & Lil, 2012; Gawande, Vaidya, Tadke, Kirpekar & Bhave, 2011; Kaviani et al., 2014), and one study considered the effects of MRT on the development of the embryo (Toosi, Akbarzadeh, Zare& Sharif, 2013).

3.1 Pilates and progressive MRT as interventions to reduce stress and anxiety during pregnancy

A total of 139 women in their 2nd and 3rd trimesters were selected for the study by Guszkowska et al. (2013a); they participated in a twice weekly Pilates or progressive MRT intervention program over six weeks. The control group took part in a traditional childbirth education program. The emotional state of the women was measured by using the POMS questionnaire, the outcome showing that a relaxation or exercise session improved the emotional state of the pregnant subjects (Guszkowska et al., 2013a). Relaxation training has been proven to be more beneficial in women with elevated levels of depression and anxiety; whereas physical exercise was proven to be more helpful in coping with feelings of tiredness and fatigue (Guszkowska et al., 2013a).

3.2 Pilates as an intervention to reduce stress and anxiety during pregnancy

A study by Guszkowska involved 199 women who took part in a 12-week intervention program (Guszkowska, 2011). Of these, 135 were in the physical exercise group that took part in a biweekly physical fitness program that incorporated Pilates. The study concluded that physical activity can improve women's quality of life during pregnancy. A second study focused on a single session of physical activity during pregnancy (Guszkowska, Langwald, Dudziak & Zaremba., 2013b). Sixty-two women were subject to the intervention program; the control group of 47 was members of a childbirth education class. Guszkowska et al. (2013b) found that a single session of physical activity – with elements of Pilates – can improve the mood of a pregnant woman.

3.3 Progressive MRT as an intervention to reduce stress and anxiety during pregnancy

All of the articles that focused on the influence of progressive MRT or relaxation techniques on the level of stress and anxiety experienced during pregnancy used the State–Trait Anxiety Inventory (STAI) for adults, as developed by Charles D. Spielberger, in conjunction with various other measurements. The use of the STAI questionnaire is supported by Gunning et al. (2010), who concluded that this self-evaluation instrument could be used with confidence in order to measure anxiety during pregnancy.

Alder et al. (2011), Urech et al. (2010) and Teixera et al. (2005) investigated the influence of a single session of active relaxation on stress and anxiety levels during pregnancy and concluded that it had a positive effect on the participants. Both Urech et al. (2010) and Teixera et al. (2005) found that the maternal heart rate decreased after active relaxation, indicating that the women were more relaxed after the session. Those with a high level of anxiety, as indicated with a measure of >40 on the STAI score (Grant et al., 2008), benefited less from the relaxation program than women with a lower anxiety level (Li & Goldsmith, 2012). Studies that used relaxation training beyond a single session had better results (Bastani et al., 2005; Tragea et al., 2014). Bastani et al. (2005) concluded that 7 weeks of relaxation training reduced stress and anxiety during pregnancy and these findings positively correlated with the results that Tragea et al. (2014) obtained after a 6-week relaxation training intervention. Reductions in low birth weight among neonates, as well as a reduction in cesarean section births and the use of instrumental extractions, are also considered to arise from extended relaxation training programs (Bastani et al., 2005).

A group of 129 pregnant women in preterm labour participated in a study by Chaung et al. (2012). Sixty-eight of them were randomly assigned to the experimental group that was given a daily relaxation program from the day they were admitted to hospital to the time of delivery. While restriction of physical activity and hospitalization are stressful experiences for any pregnant woman, daily relaxation training nevertheless was seen to improve the immediate physiological and psychological stress response in women who have experienced preterm labour (Chuang et al., 2012). Pan, Zhang and Li (2012) reported similar findings in women who were hospitalized with ectopic pregnancies (defined as a pregnancy in which the embryo implants itself outside of the uterine cavity (PCASRM, 2008)). The women participated in daily progressive MRT until they were discharged from hospital. The study found that progressive MRT improved health-related quality of life, reducing the anxiety of women with ectopic pregnancies who were treated using methotrexate.

Hyperemesis gravidarum (an extreme form of morning sickness) can increase both anxiety levels as well as extend hospitalization during pregnancy, leading to significant psychological stress (Gawande et al., 2011). Thirty pregnant women (experiment group 15; control group 15) with this condition participated in a 2-week study by Gawande et al. (2011). The experimental group was given daily progressive MRT interventions and received pharmacotherapy while the control group received only pharmacotherapy. Gawande et al. (2011) concluded that progressive MRT was effective in managing hyperemesis gravidarum. Relaxation training is also effective in lowering systolic blood pressure and fasting blood sugar in pregnant women with gestational diabetes (Kaviani et al., 2014).

Gedde-Dahl and Fors (2012) performed a study on 54 women in their last trimester of pregnancy, examining the effects of relaxation exercises on the birthing experience. The intervention group of 27 listened to a compact disc of relaxation and guided imagery daily until they gave birth. The study concluded that a simple self-administered and self-instructed guided-imagery and relaxation technique is able to support the birth experience with advantage (Gedde-Dahl &Fors, 2012). A 4-week study that included 84 pregnant women concluded that relaxation training during pregnancy has a substantial effect on embryonic development (Toosi et al., 2013). Evaluating the neonatal health indexes of the experimental and control groups showed that the height of newborns in the experimental group was significantly greater. The study furthermore showed that newborns in the experimental group expressed significantly fewer hard cries than newborns within the control group (Toosi et al., 2013).

4. Conclusion

Few published studies have examined Pilates and progressive MRT as interventions in order to reduce anxiety and stress during pregnancy. Yet both Pilates (Swann, 2009) and progressive MRT (Conrad & Roth, 2007) are cost-effective and relatively easy methods that can be used to reduce anxiety and stress. Pilates is well suited for pregnant women as it involves low impact exercise that offer emotional, mental and physical benefits (Dillard, 2013).

Studies, however limited, were identified that used exercises that incorporated Pilates but no studies were identified that investigating the effects of Pilates – exclusively – on stress and anxiety during pregnancy. No subsequent investigations that considered the effects of Pilates – exclusively – regarding any aspect of pregnancy were identified in the last 10 years. This gap in the available research, although identified (Balogh, 2005), remains unaddressed. For example, more research is recommended to determine the physiological and psychological effects of this method during pregnancy.

Considerably more research has been conducted on the benefits of progressive MRT, compared with Pilates, on stress and anxiety levels during pregnancy. Progressive MRT is not only effective in reducing stress and anxiety at this time (Alder et al., 2011; Urech et al., 2010; Teixeira et al., 2005; Bastani et al., 2005; Tragea et al., 2014), but also in reducing these states in women presenting with certain conditions – ectopic pregnancy, gestational diabetes, preterm labour and hyperemesis gravidarum– related to pregnancy (Pan, Zhang & Li, 2012, Gawande et al., 2011; Kaviani, 2014). Moreover, self-administered, self-instructed relaxation techniques are advantageous to the birthing experience (Gedde-Dahl &Fors, 2012). The beneficial effects of progressive MRT are shared by both the mother and her newborn, which gives out fewer hard cries and is physically larger (Toosi et al., 2013) than neonates in a control group.

No studies were found which specifically focused on Pilates and progressive MRT as interventions in the reduction of stress and anxiety levels during pregnancy in the last 10 years (2005–2015).
Only studies that used exercises with elements of Pilates as the intervention were identified and thus we cannot conclude that Pilates – exclusively – can alleviate maternal stress and anxiety. The findings of this review indicate that there is strong evidence that progressive MRT is an effective – complementary and alternative – method in the reduction of stress and anxiety levels during pregnancy.

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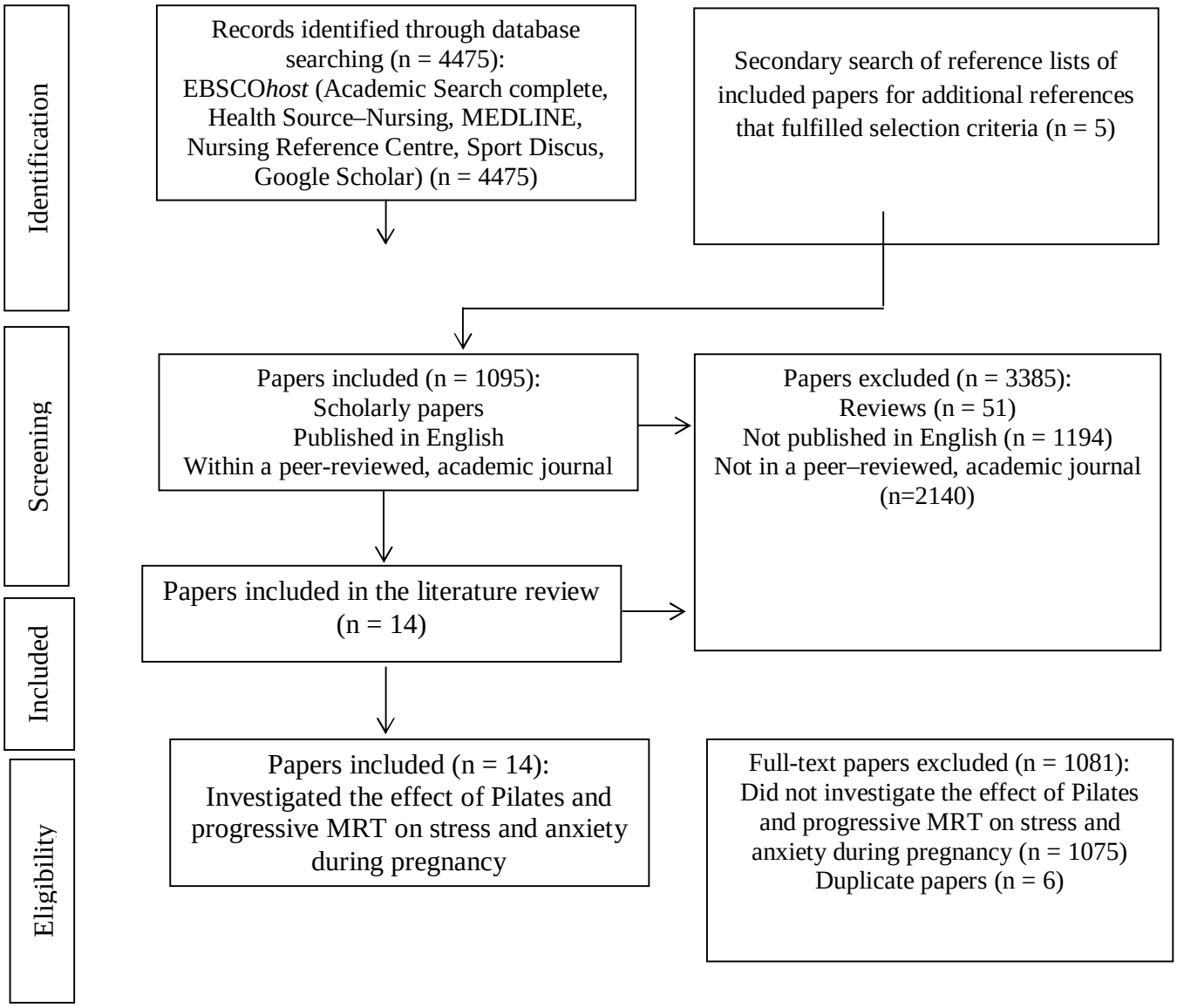
Appendix A

PRISMA flow chart of search strategy



Appendix B

Studies that fulfilled the selection criteria

Source	Population	Intervention	Intervention duration	Number of participants	Age (mean ± SD)(years)	Main findings
Guszkowska et al. (2013b)	Pregnant women in 2nd and 3rd trimester	Progressive relaxation, physical exercise program (elements from Pilates), child birth education program	Twice a week for 6 weeks	139 (relaxation group n = 42; physical exercise n = 56; control group n = 41)	28.6 ± 2.99	Physical exercise is beneficial in coping with fatigue and feelings of tiredness; relaxation training is beneficial with elevated levels of anxiety and depression
Guszkowska (2011)	Pregnant women in 2nd and 3rd trimester	Physical fitness program (Pilates, yoga and body ball exercises)	Twice a week for 12 weeks	199 (exercise group n = 135; inactive group n = 64)	27.36 ± 3.637	Physical activity can improve a pregnant women's quality of life
Guzskowska et al. (2013a)	Pregnant women in 2nd and 3rd trimester	Physical exercise (elements from Pilates) and childbirth education class	A single session	109 (physical exercise group n = 62; childbirth education group n = 47)	29.02 ± 3.76	A single-exercise session can improve the mood of pregnant women
Alder et al. (2011)	Pregnant women in 3rd trimester	Progressive MRT, guided imagery or passive relaxation	2 hours	39	33.4 ± 4.8	Pregnant women with high levels of trait anxiety benefited less than women with low levels from a single standardized relaxation period
Urech et al. (2010)	Pregnant women	Progressive MRT, guided imagery or passive relaxation	2 hours	39 (progressive MRT group n = 13; guided-imagery group n = 13; control group n = 13)	Progressive MRT 33.1 ± 4.7; guided imagery 34.1 ± 5.2; control group 33 ± 4.8	Guided imagery was significantly more effective in enhancing levels of relaxation. Guided imagery and progressive MRT were associated with a significant decrease in heart rate
Teixera et al. (2005)	Pregnant women 28-32 weeks	Active or passive relaxation	Single session	58	Not reported	Active and passive relaxation were effective in reducing a state of anxiety but the active form was more significant
Bastani et al. (2005)	Pregnant women in 2nd trimester	Relaxation training	7 Weeks	110	23.8	Relaxation reduced anxiety and perceived stress as well as a reduction in low birth weight, caesarean section and instrumental extraction
Tragea et al. (2014)	Pregnant women in 2nd semester	Stress management program with relaxation breathing and progressive MRT	Twice a day for 6 weeks	60 (intervention group n = 31; control group n = 29)	29.35	Relaxation therapy reduces perceived stress as well as increase of sense of control in pregnant

						women
Chuang et al. 2012)	Pregnant women in preterm labour 20-34 gestational weeks	Relaxation program or educational program	Preterm labour	129 (experiment group n = 68; control group n = 61)	31.13 ± 4.42	Relaxation training can improve the stress responses of women with preterm labour
Pan, Zhang & Li (2012)	Pregnant women with ectopic pregnancies	Progressive MRT	Daily until discharge from hospital (average training period 15.8 ± 3 days)	80 (MRT n = 39; control group n = 41)	Experimental group 26.9 ± 7.4; control group 26.2 ± 8.1	Progressive MRT can effectively improve the health-related quality of life and anxiety of women with ectopic pregnancies receiving methotrexate treatment
Gawande et al. (2011)	Pregnant women in 1st trimester with hyperemesis gravidarum	Progressive MRT and pharmacotherapy	Daily for 2 weeks	30 (experimental group n = 15; control group n = 15)	Experimental group 24 ± 2.5; control group 23.26 ± 3.05	Progressive MRT is effective in managing hyperemesis gravidarum (extreme form of morning sickness)
Kaviani et al. (2014)	Pregnant women with gestational diabetes	Education training including Benson's relaxation training	Weekly for 3 weeks	58 intervention group n = 29; control group n = 29)	18-40	Relaxation training is effective in lowering systolic blood pressure and fasting blood sugar
Gedde-Dahl &Fors (2012)	Pregnant women in 3rd trimester	Self-administered and self-instructed relaxation and guided imagery	Daily until birth	54 (CD intervention group n = 27; control group n = 27)	30.5 ± 3.5	Self-administered and self-instructed relaxation and guided imagery can be used to positively support the birth experience
Toosi et al. (2013)	Pregnant women in 3rd trimester	Relaxation techniques (Benson's technique)	Daily for 4 weeks	84 (relaxation group n = 42; control group n = 42)	18-35	Relaxation training during pregnancy has considerable effects on embryonic development