ORIGINAL ARTICLE

Music Therapy on Anxiety, Stress and Maternal-fetal Attachment in Pregnant Women During Transvaginal Ultrasound

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Purpose The purpose of this study was to examine the effects of music therapy on anxiety, stress and maternal-fetal attachment in pregnant women during a transvaginal ultrasound.

Methods This study was a nonequivalent control group nonsynchronized design. Pregnant women ($n = 232$) were assigned to experimental ($n = 117$) and control ($n = 116$) groups respectively. The data were collected from August 2 to 27, 2010. The experimental group received general prenatal care and single 30-minute session of music therapy, while the control group received only general prenatal care. Anxiety, stress, and maternal-fetal attachment was assessed using three self-report measures by State scale of the State-Trait Anxiety Inventory (1976), Pregnant women's stress scale of Ahn (1984) and Cranley's (1981) maternal-fetal attachment scale.

Results The music therapy group showed statistically significant decrease in anxiety compared to control group but no significant difference was identified in stress and maternal-fetal attachment.

Conclusions The finding provides evidence for use of nursing intervention in prenatal care unit to reduce pregnant women's anxiety. Further research is necessary to test the benefits of music therapy with different frequency and duration. [*Asian Nursing Research* 2011;5(1):19–27]

Key Words anxiety, attachment, music therapy, pregnant stress, ultrasound

INTRODUCTION

Most women experience a variety of stress when confronting the emotional, physical and social changes that occur during pregnancy (Chang, Chen, & Huang, 2008). Additionally, pregnant women experience anxiety over their baby's health and pending lifestyle change (Chang et al., 2008). Of prenatal examinations, transvaginal ultrasound (TVUS) is one of the most frequently used diagnostic modalities to calculate gestational age and evaluate fetal anomalies in obstetrics (Callen, 2008). However, because TVUS is an invasive investigation, pregnant women with TVUS are reported to suffer stressful situations including pain, fear, discomfort, lack of control and movement, which are common anxious reactions (Clement, Candy, Heath, To, & Nicolaides, 2003). It was shown that life event stress and anxiety

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experience during pregnancy might cause significant abnormal obstetric outcome including spontaneous abortion, preterm labor, growth retardation and decrease in maternal-fetal attachment (DiPietro, 2010; Muller, Bleker, Bonsel, & Bilardo, 2006; Van den Bergh, Mulder, Mennes, & Glover, 2005). Also, increased anxiety and stress activate tension and pain, possibly leading to delay and stop of procedure (Park & Na, 2003).

In order to relieve anxiety and stress and to promote relaxation, diverse interventions such as pharmacologic therapy, patient education, massage, aromatherapy and reflexology have been used. However, pharmacology should be cautiously used for mother and fetus. One of the nonpharmacological nursing interventions is the use of music as a therapeutic modality (Gillen, Biley, & Allen, 2008). In the past decade, music has been known to have therapeutic effects on the body and the mind (Liu, Chang, & Chen, 2010). That is, by neutralizing negative emotions, music elevates the stress threshold, harmonizes inner processes, helps patients attain an advanced state of relaxation and reduces stress. The aesthetic pleasure received by the right brain can release endorphins from the pituitary gland, thereby decreasing physiologic response and relaxation. Moreover, music changes the interaction of the thalamus and the reticular activating system, and effects emotions, body musculature and autonomic functions such as blood pressure, heart rate and respiration rate (Chang et al., 2008; Sidorenko, 2000; Wigram, Pederson, & Bonde, 2002). Especially, soothing music with a flowing, lyrical melody, simple harmony, soft tonal colour and easy rhythm (roughly 60–80 beats/minute) can simulate a relaxation response and facilitate emotional homeostasis in adults and children (Chang et al.; Han et al., 2010; Hayes, Buffum, Lanier, Rodahl, & Sasso, 2003; Liu et al., 2010). In Korea, prenatal music out of the soothing music is believed to give rise to maternal stable condition both psychologically and physically, and to help create comfortable environment for fetus (Choi, 2002). Moreover, self-nursing care including listening to prenatal music for fetus can enhance a maternal-fetal attachment (Yang & Kim, 2010).

Music as a therapeutic intervention has also been applied in a variety of patient conditions, with age ranging from adults to old people (Han et al., 2010; Jeon, Kim, & Yoo, 2009; Lai et al., 2006; Lee, 2010; Na & Yang, 2009; Park & Na, 2003). Especially, many researches support the positive effects for music therapy applied during pregnancy on reducing anxiety and stress (Chang & Chen, 2005; Laopaiboon, Lumbiganon, Martis, Vatanasapt, & Somjaivong, 2009; Liu et al., 2010; Yang et al., 2009), as well as on increasing maternal-fetal attachment (Lee; Yang & Kim, 2010). However, most studies only reported that music has been found to be effective for relieving anxiety, stress and pain during preterm, labor and cesarean delivery. No studies have yet been reported whether music therapy can influence anxiety, stress and maternal-fetal attachment in pregnant women during TVUS. Given this background, therefore, this study was conducted to evaluate the effects of nursing intervention using the music therapy to relieve the anxiety and stress for the pregnant women who experienced TVUS. In addition, this study tried to evaluate the effectiveness of prenatal music listening to enhance maternal-fetal attachment in practical nursing setting.

Purpose of the study

The purpose of the study was to identify the effects of music therapy on anxiety, stress and maternal-fetal attachment in pregnant women undergoing a TVUS examination. This study explored three hypotheses: (a) Pregnant women in the music intervention group will have a lower anxiety level than the control group; (b) pregnant women in the music intervention group will have a lower stress level than the control group; (c) pregnant women in the music intervention group will have a higher maternal-fetal attachment level than the control group.

METHODS

Study design

This study was a nonequivalent control group nonsynchronized design (Figure 1).

Group	Pretest	Posttest	Pretest	Treatment	Posttest
Experimental			Ye1	X	Ye2
Control	Yc1	Yc2			

X: Music therapy; Ye1, Yc1: Demographic-Obstetric Characteristics, STAI, PSS, and MFAS; Ye2, Yc2: STAI, PSS, and MFAS.

Figure 1. Research design. STAI = State-Trait Anxiety Inventory; PSS = Pregnant Stress Scale; MFAS = Maternal-fetal Attachment Scale.

Setting and samples

This study was conducted from August 2 and 27, 2010 in general hospital "C" in Seoul, Korea which had on average 600 deliveries per month. Participants were recruited from pregnant women who visited the hospital for obstetrical ultrasound at first trimester. Inclusion criteria were pregnant women with following conditions: (a) single pregnancy; (b) before 14 weeks of gestation (first trimester); (c) not expected to have maternal disease and gestational complication; (d) not expected to have fetal anomaly; (e) consented to participate in the study; (f) without hearing impairment; (g) Korean.

In the early first trimester pregnancy, somewhat invasive TVUS is performed and transabdominal ultrasound is performed during the second and third trimester of pregnancy. Thus, only pregnant women at the first trimester were included in the study to reduce the error resulting from the different method of examination.

The effect size was estimated according to previous studies on the effects of music as an intervention for hospital patients (Chang et al., 2008; Han et al., 2010). For effect size of 0.50 and an alpha of .05 (two-tailed) with a power of 0.9 by analysis using G* power 3.0, a minimum of 86 participants per group were required. Firstly, 240 were recruited with taking into consideration of possible dropout. Seven women dropped out because they (a) had an anomalous fetus ($n = 5$); (b) rejected ($n = 1$); or (c) did not finish the questionnaire ($n = 1$). Ultimately, 233 participants were included in the analysis. Of these, 117 women were enrolled in the experimental group, and 116 women in the control group.

Measurements

Maternal state anxiety was measured by using the State-Trait Anxiety Inventory (STAI) Scale Form developed by Spielberger and Diaz-Guerrero (1976). The STAI consists of 20 self-descriptive statements for the state anxiety scale. Participants respond on a 4-point Likert-type scale. The range of possible scores on each is from 20 to 80 points. Higher scores indicate greater anxiety. The STAI was translated into Korean and tested by Kim and Shin (1978). The Cronbach alpha of original STAI and Korean STAI were .91–.93 and .87. In this study, the Cronbach alpha was .61.

Ahn (1984)'s Pregnant Stress Scale (PSS) assessed the perceived stress in the pregnant women. This scale was categorized into fetus-related stress (9 items), self-related stress (11 items) and husband-related stress (6 items). This study used 20 items except for husband-related stress. Participants respond on a 5-point Likert-type scale and the total possible score can range from 20 to 100. Higher scores indicate greater stress. The Cronbach alpha was .84 in Ahn's study and was .88 in this study. The 23 item Maternal-fetal Attachment Scale (MFAS) was applied to assess the level of maternal-fetal attachment (Cranley, 1981). The MFAS consists of five subscales: differentiation of self from fetus (3 items), giving of self (6 items), role taking (4 items), interaction with fetus (4 items) and attributing characteristics to the fetus (6 items). This study used MFAS translated into Korean and revised by Kim (1991). The MFAS of 4-point Likert scale scores ranged from 23 to 92 with high scores indicating a high level of maternal-fetal attachment. The Cronbach

alpha was .83 in Kim's study and was .93 in this study.

Demographic-obstetric information of participants were collected from patients and medical records with respect to age, education, economic status, religion, occupation, marriage duration, gravidity, spontaneous abortion experience, gestation, type of pregnancy, wanted pregnancy, prenatal music experience, ultrasound experience, satisfaction of marriage life and family support.

Procedure

Approval for this study was obtained from the Cheil General Hospital Institutional Review Board prior to implementation of the study. All participants were provided with a full explanation of the study and invited to participate. Confidentiality and anonymity were strictly observed. Informed consent to participate was obtained from all participants. Patients were told that they have rights to withdraw at anytime throughout the study and nonparticipation would not have any detrimental effects in terms of the essential or regular hospital treatments and services received.

From August 2 to August 13, 2010, participants assigned to the control group were asked to complete a demographic-obstetric information, and the STAI, PSS, and MFAS. The control group received general prenatal TVUS only. From August 16 to August 27, 2010, participants assigned to the intervention group were asked to complete a demographic-obstetric information and the STAI, PSS, and MFAS and had a single 30-minute session of listening to music during TVUS examination. Both the experimental and the control groups were asked to the same questionnaires again excluding demographic-obstetric information after TVUS examination. Participants were unaware of the design of the study and the groups assigned to them.

For the music of this research, the authors decided on "Prenatal music album with the sound of nature" with highest sales volume in the antenatal music section after consulting music charts of online company M, offline company K, and Y. The music was played using an MP3 player and started when women entered TVUS examination room and kept playing until they left. The volume of the music was adjusted to the women's satisfaction. Playing time was limited to single 30-minute sessions, because, firstly, most of the previous studies on music therapy limited time between 15 and 40 minutes (Gillen et al., 2008; Han et al., 2010; Lai et al., 2006), and secondly, the overall TVUS examination takes 30 minutes including changing clothes. Three nurses, including this researcher, provided the music therapy, and all of them are American Registry Diagnostic Medical Sonographer.

Data analysis

The statistical package of the social science program (SPSS) for window 15.0 was used for data analysis (SPSS inc., Chicago, IL, USA). Descriptive statistics, including the percentage and mean (*SD*), were calculated. An independent *t* test and chi-square test were used to test the difference in the demographic-obstetric variables and pretest of STAI, PSS and MFAS scores between the experimental and control groups. To test the effects of music therapy, an independent *t* test was applied to test for any difference between pretest and posttest data for the control and experimental groups.

RESULTS

In total, 233 pregnant women were enrolled in this study. The experimental group consisted of 117 women, the control group consisted of 116 women. No significant differences were identified between groups for age, education, economic status, religion, occupation, marriage duration, gravidity, spontaneous abortion experience, gestation, type of pregnancy, wanted pregnancy, prenatal music experience, ultrasound experience, satisfaction of marriage life and family support (Table 1). Also no significant differences were identified for pretest of STAI ($t=0.88$, $p=.380$), PSS ($t=1.64$, $p=.102$) and MFAS ($t=-0.00$, $p=.999$) scores between the experiment group and the control group (Table 2). Therefore, the STAI, PSS, and MFAS scores for these two groups prior to music intervention were similar.

Table 1

Homogeneity Test of Demographic-obstetric Characteristics (N = 233)

Characteristics	Categories	Exp. (*n* = 117)	Cont. (*n* = 116)	χ^2	*p*
		n (%)	*n* (%)		
Age (yr)	< 30	15 (12.8)	24 (20.7)	2.67	.264
	30–34	64 (54.7)	56 (48.3)		
	≥ 35	38 (32.5)	36 (31.0)		
Education	≤ High school	11 (9.4)	19 (16.4)	2.53	.122
	≥ College	106 (90.6)	97 (83.6)		
Economic status	Low	5 (4.3)	15 (12.9)	5.79	.055
	Middle	69 (59.0)	59 (50.9)		
	High	43 (36.8)	42 (36.2)		
Religion	Have	75 (64.1)	73 (62.9)	0.04	.892
	Do not have	42 (35.9)	43 (37.1)		
Occupation	Have	70 (59.8)	68 (58.6)	0.04	.894
	Do not have	47 (40.2)	48 (41.4)		
Marriage duration (yr)	< 1	41 (35.0)	29 (25.0)	3.68	.159
	1–5	48 (41.1)	61 (52.6)		
	> 5	28 (23.9)	26 (22.4)		
Gravidity	Primigravida	53 (45.3)	49 (42.2)	0.22	.693
	Multigravida	64 (54.7)	67 (57.8)		
Spontaneous abortion experience	Yes	35 (29.9)	30 (25.9)	0.48	.560
	No	82 (70.1)	86 (74.1)		
Gestation (wk)[a]	11	10 (8.5)	12 (10.3)	1.45	.484
	12	80 (68.4)	78 (67.3)		
	13	20 (17.1)	26 (22.4)		
Type of pregnancy	Natural	103 (88.0)	101 (87.1)	0.50	.845
	Artificial	14 (12.0)	15 (12.9)		
Wanted pregnancy	Yes	109 (93.2)	102 (87.9)	1.86	.187
	No	8 (6.8)	14 (12.1)		
Prenatal music experience	Have	80 (68.4)	81 (69.8)	0.06	.887
	Do not have	37 (31.6)	35 (30.2)		
US experience	Have	80 (68.4)	81 (69.8)	0.06	.887
	Do not have	37 (31.6)	35 (30.2)		
Marriage life	Satisfied	112 (95.7)	112 (96.6)	–	.505[b]
	Not satisfied	5 (4.3)	4 (3.4)		
Family support	Satisfied	114 (97.4)	111 (95.7)	–	.356[b]
	Not satisfied	3 (2.6)	5 (4.3)		

Note. Exp. = experimental group; Cont. = control group; US = ultrasonography.
[a]Missing value: excluded; [b]Fisher's exact test.

The independent *t* test (Table 3) was performed to test the difference between pretest and posttest data between the control and experimental group. In the independent *t*-test, the difference of STAI score between two groups was only significant statistically ($t = -2.02$, $p = .044$) and the difference of PSS and MFAS score between two groups were not significant statistically ($t = -1.13$, $p = .259$; $t = -0.44$, $p = .659$).

Table 2

Homogeneity Comparison of Anxiety, Stress and Maternal-fetal Attachment Between Groups

Variables	Exp. (n = 117)	Cont. (n = 116)	t	p
	M (SD)	M (SD)		
Anxiety (STAI)	43.72 (3.78)	43.23 (4.61)	0.88	.380
Stress (PSS)	54.12 (8.81)	52.12 (9.76)	1.64	.102
Maternal-fetal attachment (MFAS)	64.12 (11.53)	64.12 (11.53)	0.00	.999

Note. Exp. = experimental group; Cont. = control group; STAI = State-Trait Anxiety Inventory; PSS = Pregnant Stress Scale; MFAS = Maternal-fetal Attachment Scale.

Table 3

Comparison of Pretest and Posttest on Anxiety, Stress and Maternal-fetal Attachment Between Groups

	Pretest	Posttest	Difference	t	p
	M (SD)	M (SD)	M (SD)		
Anxiety (STAI)					
Exp. (n = 117)	43.72 (3.78)	42.79 (3.57)	0.93 (4.87)	2.02	.044
Cont. (n = 116)	43.23 (4.61)	43.87 (4.84)	–0.64 (6.76)		
Stress (PSS)					
Exp. (n = 117)	54.12 (8.81)	51.78 (9.85)	2.34 (12.50)	1.13	.259
Cont. (n = 116)	52.12 (9.76)	51.78 (10.49)	0.34 (14.36)		
Maternal-fetal attachment (MFAS)					
Exp. (n = 117)	64.12 (11.53)	64.81 (11.51)	0.69 (15.24)	–0.44	.659
Cont. (n = 116)	64.12 (11.53)	65.73 (13.08)	1.61 (16.49)		

Note. Exp. = experimental group; Cont. = control group; STAI = State-Trait Anxiety Inventory; PSS = Pregnant Stress Scale; MFAS = Maternal-fetal Attachment Scale.

Therefore, the music therapy group showed statistically significant decrease in anxiety compared to control group but no significant difference were identified in stress and maternal-fetal attachment.

DISCUSSION

Pregnancy can be a difficult period for women because it presents physiological and psychological challenges (Van den Bergh et al., 2005). One such challenge is the TVUS. Although it is considered a routine examination, certain pregnant women consider it to be stressful and become rather anxious during the process. However, music therapy can serve as a therapeutic modality that lowers physiologic responses of stress response and anxiety among pregnant women undergoing a TVUS (Han et al., 2010). Given this background, this study analyzed the effects of music therapy on anxiety, stress, and maternal-fetal attachment in pregnant women.

The results of this study revealed that music therapy was effective in decreasing anxiety in pregnant women during a TVUS examination. This result is similar to that of Liu et al. (2010), Yang et al. (2009), Chang et al. (2008), and Kwak (2006). Liu et al. revealed that, as compared with the control group, pregnant women who listened to music for

30 minutes each during the latent and active periods of labor reported significantly lesser pain, and anxiety and higher finger temperature during the latent phase of labor. In Yang et al., women in the experiment group received music therapy for 30 minutes on 3 consecutive days; it was found that their anxiety levels decreased and physiologic responses improved significantly. Further, Chang et al. reported that daily sessions of 30-minute music therapy for 2 weeks significantly reduced anxiety, stress, and depression in pregnant women; they concluded that listening to music may be good for health during pregnancy. Kwak reported that primigravida who received antenatal music therapy for 40 minutes revealed decreased anxiety and stress levels. Thus, as revealed in previous research (Chang et al.; Chang & Chen, 2005; Kwak; Liu et al.; Yang et al.), this study also found that music therapy caused the negative feelings of pregnant women to become positive, thereby reducing anxiety. However, the results of this study indicated that there was a rather small difference in the scores of the pretests and posttests (0.93 point), and a statistical significance with $p = .044$ in decreasing anxiety. This result may give rise to a controversy in terms of the clinical significance of music therapy in lessening anxiety among pregnant women. Thus, repeated research must be conducted with a different sample size. Moreover, unlike the studies of Chang et al. and Kwak, this study reported that music therapy was not effective in relieving stress in pregnant women undergoing a TVUS. This may be because pregnancy stress may have increased or decreased over a long period and, in previous research, music was played for a longer duration or for more than one session; on the other hand, in this study, music was played for a shorter duration and only a single session of therapy was provided. Further study is necessary to identify the effects of music therapy with different durations and frequencies in pregnant women. In addition, in Kimber, McNabb, McCourt, Haines, and Brocklehurst (2008) and Laopaiboon et al. (2009), music therapy was found to be ineffective. Kimber et al. studied the effects of massage or music therapy practiced during physiological changes in pain threshold, from late pregnancy to childbirth. Their study reported a trend towards slightly lower mean pain scores in the intervention group; however, these differences were not statistically significant. Moreover, Laopaiboon et al. reported that music therapy had an effective on only pulse rate and satisfaction level; however, it was ineffective in pregnant women during cesarean section. Thus, he suggested that the study be repeated. Further, personal preferences and experience of pregnant women has a strong impact on the effectiveness of music therapy (Gillen et al., 2008; Hayes et al., 2003; Lai et al., 2006). Music intervention was not effective in Laopaiboon et al. and Kimber et al. probably because the researchers did not consider the participants' personal preference when selecting the music, or that the music was not played for a sufficiently long duration. Therefore, further research must be conducted with longer music duration or by taking into consideration the personal preferences of the pregnant women.

Unlike Lee (2010) and Yang and Kim (2010), this study revealed that music therapy was not significantly effective in improving maternal-fetal attachment in pregnant women. The differing results are probably because Lee evaluated the maternal-neonatal attachment in the postnatal period, while this study evaluated the maternal-fetal attachment in prenatal period, specifically, between 11 and 14 weeks of gestation, for a single 30-minute session. During this stage of early gestation, pregnant women display less recognition of their babies because of the lack of fetal movement. Thus, music therapy may have been insignificant on the maternal-fetal attachment test conducted in this study. Moreover, Yang and Kim's study used a prenatal program that included music therapy for 4 weeks in order to enhance parental-fetal attachment. Thus, we can infer that longer duration of music and a combination of various prenatal programs such as music, reading, and exercise, may enhance maternal-fetal attachment. Further study is necessary to study the effects of music therapy after the second trimester of pregnancy.

This study has some limitations. First, only a single 30-minute listening session was used in this study as nursing therapy; thus, the testing effect may have occurred. We did not compare this effect with the

group that underwent a repeated/long-term music therapy session. Therefore, the findings of this study cannot provide any generalized conclusions in terms of therapeutic dosage (duration and number of sessions) for music therapy among pregnant women undergoing TVUS.

Second, because pregnancy stress and maternal-fetal attachment may increase or decrease during the 280 days of pregnancy, these variables may not be appropriate to test the effect of one-time music therapy. Further studies must be conducted using physiologic variables such as vital signs or level of discomfort during examination.

Finally, even though the sample hospital had a large number of deliveries (approximately 600 cases per month), the findings of this study cannot be generalized because data were collected from only one institution.

CONCLUSION

This study was implemented to identify the effects of music therapy on anxiety, stress and maternal-fetal attachment in pregnant women during a TVUS examination. And this study confirmed that listening to music resulted in significant reduction of anxiety in pregnant women undergoing a TVUS. This result could be applied to independent nursing care in obstetrical examination rooms and ward.

Based on this result, we suggest as follows. First, personal preference should be considered so that diverse music interventions can be provided to identify the effects of music therapy in further research. Second, further research is necessary to determine the appropriate frequency and duration of the music intervention. Finally, repeated studies with larger sample from diverse hospitals are necessary to identify the effect of music therapy in pregnant women.

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