THE FLORIDA STATE UNIVERSITY

COLLEGE OF MUSIC

THE EFFECTS OF MUSIC THERAPY ON PHYSIOLOGICAL MEASURES,
PERCEIVED PAIN, AND PERCEIVED FATIGUE
OF WOMEN IN EARLY LABOR

By

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ABSTRACT

This study examined the effects of music therapy on women in early labor. Dependent variables were fetal heart rate (FHR), uterine contraction intensity (UCI), perceptual pain, and perceptual fatigue. Subjects were forty (N=40) parturients undergoing labor induction procedures. Subjects were randomly assigned to an experimental group (N=20) or control group (N=20). All subjects gave written consent prior to participation in the study. Results showed no significant differences in demographic or labor state variables between groups. ANOVA revealed self reported pain and fatigue were significantly lower for the music group. No significant differences were found for fetal heart rate or uterine contraction intensity. Further results and implications are discussed.
INTRODUCTION

Labor pain is often severe and in many cases, not sufficiently relieved (Ranta, et al, 1995). Childbirth pain that is not alleviated may have harmful physiological effects (Bonica, 1994) and/or lead to emotional stress, which may slow the progress of labor (Saisto, Ylikorkala & Halmesmaki, 1999). In addition, adequate pain relief is important to patient satisfaction (Sadler, Davison & McCowan, 2001).

Research has shown that music and other integrative therapies may be beneficial to the well-being of women in labor (Payne, 2000; Simkin & Bolding, 2004). In Standley’s (2000) meta-analysis of music research in medical treatment, music was found to be more effective for women than men and when some pain is present. However, music seems to become less effective as pain increases. Studies included in the meta-analysis as well as studies published since indicate that music may be used effectively during specific stages of labor as a natural analgesia (Browning, 2001; Clark, McCorkle & Williams, 1981; Coddington, 1982; Hanser, Larson & O’Connell, 1983; Liebman & MacLaren, 1991; Winokur, 1984).

Research relative to music and labor induction is sparse. Music may alter perception of pain caused by synthetic oxytocin. Music may also alter perception of other stressors specific to labor induction procedures such as venous puncture, vaginal insertion, fatigue due to deprivation of sleep, and anxiety due to maternal conditions (e.g. gestational diabetes, preeclampsia).

Most experimental research regarding music therapy in childbirth has utilized preferred, live music listening (Browning, 2001; Clark, McCormel & Williams, 1981; Coddington, 1982; Hanser, Larson & O’Connell, 1983; Liebman & MacLaren, 1991; Winokur, 1984). With regards to pain perception, investigation
into the effect of other music therapy techniques such as vocal production is certainly warranted.
CHAPTER 1

LITERATURE REVIEW

Brief Childbirth History

Childbirth preparation and education became popular in the 1950s when Dick-Read launched the natural childbirth movement (Payne, 2001). Laboring women were no longer put under complete anesthesia, and in the following decades, nonpharmocological methods for childbirth were introduced by figures such as Lamaze and Bradley (Sears & Sears, 1994). These methods, often described as “psychoprophylactic,” painless, or natural pain management methods, have enabled mothers to retain consciousness during birth, so that they are awake and alert for delivery and the first moments of the newborn’s life. As the twentieth century went on, labor and delivery staff no longer administered the so-called “twilight sleep,” which drastically altered the mother’s state of mind and, in fact, caused the mother to lose consciousness during delivery (Sears & Sears, 1994). British obstetrician Dick-Read popularized the natural childbirth movement through writings based on his observations and description of the fear-tension-pain cycle, a psychological and physiological downward spiral from which so many women suffered (Dick-Read, 1944). Through the end of the century and currently, obstetrical and midwifery practice has established an even stronger focus on the benefits of alertness, consciousness, active participation at birth, maternal satisfaction, and childbirth education (Sears & Sears, 1994). The importance of childbirth education is further validated through statistical trends of today; a 2004 report by the National Center for Health Statistics shows that infant mortality decreases as the education of the mother increases (Health, p. 29).
Labor Induction Overview

For the purpose of clarity, a distinction should be made between the terms “labor induction” and “labor augmentation.” Labor augmentation is defined as medically altering the progress of labor in which there is a spontaneous onset; whereas, labor induction refers to the process of initiating labor by medical means. Occurrences of labor induction procedures have greatly increased in the United States during the past 20 years. Kozak & Weeks (2002) extracted data from the National Hospital Discharge Survey (NHDS) and found that medical induction of labor was reported approximately 1 out of every 100 deliveries in 1980; the researchers found that the rate had dramatically increased to 11.7 out of every 100 deliveries by the year 2000. The results may be somewhat inflated due to the NHDS format for data collection (Kirby, 2004); nonetheless, most researchers agree that instances of labor induction have increased precipitously in recent years (Kirby, 2004; Kozak & Weeks, 2002; MacDorman, Mathews, Martin & Malloy, 2002; Zhang, Yancey & Henderson, 2002).

Women may be induced for labor for medical reasons or simply for reasons of preference. In either case, the first priority is to avoid complications in childbirth; maternal complications of pregnancy that affect the newborn are the fourth leading cause of death of infants less than one year old (Health, p. 92).

Medical reasons for inducing labor include the following: reduction in morbidity of the mother and fetus, conditions such as diabetes mellitus, preeclampsia, poor obstetric history such as a previous stillbirth, placental insufficiency, rhesus isoimmunization with haemolysis, intrauterine death, severe congenital abnormalities, placental abruption, previous precipitate labor, or an unstable lie (a condition wherein the fetus frequently changes from one position to another) (Byrd, 2001; Stables, 1999). The following are non-medical indications for which attending medical staff may pursue elective labor induction: post-date pregnancy, maternal and family preference, pain and discomfort, and patient exhaustion (Byrd, 2001). Pharmacological induction may prevent
complications in mothers and fetuses whose health would otherwise be compromised because of certain conditions (Stables, 1999).

Elective labor induction (defined as medically induced labor for reasons of preference rather than medical reasons) may be riskier than childbirth with spontaneous onset of labor. In a logistic regression analysis of 11,849 parturients, Glantz (2005) found that elective labor induction is associated with more intrapartum interventions, more Cesarean deliveries, and longer maternal length of stay. Research on the benefits of labor induction is lacking (Byrd, 2001).

**Labor Induction Procedures**

Three common labor induction medical interventions follow: administration of synthetic oxytocin, administration of prostoglandin, and artificial rupture of membranes. Each intervention serves a particular function and has distinct advantages and disadvantages.

Oxytocin is the natural hormone released by the body as the fetus stimulates the cervix and vagina; oxytocin enhances uterine contractions to prepare for and facilitate birth and delivery. Pitocin is the trademark name for synthetic oxytocin and is used to induce labor and/or augment the progress of labor.

Another natural chemical released in the body during childbirth is prostaglandin; this hormone causes the cervix to become soft and stretchy. When necessary for labor inductees, Cervidil, the trademark name for a prostaglandin vaginal insert, may be used to ripen the cervix.

Attending medical staff may pursue an artificial rupture of membranes (AROM) procedure in addition to synthetic oxytocin to initiate labor pains and cervical ripening.

**Stressors of Labor Induction**

Labor induction is a stressful procedure for some parturients. Upon arrival at the medical facility, women are usually administered a labor inducing agent
intravenously and/or cervical ripening agent via vaginal insertion. Venous puncture and vaginal insertion may provoke anxiety or pain. Also, the administration of these drugs may restrict the woman’s ability to ambulate during labor. According to results of a survey of birthing women in Poland, walking during the first stage of labor was important for 73% of the respondents (Moneta, et al, 2001).

In addition, women with diagnoses such as gestational diabetes or preeclampsia may experience heightened anxiety because of discomfort, pain, or risks involved. Ben-Harough, Yogey, et al (2005) found that women with hypertensive disorders and unfavorable cervix following induction of labor with vaginal application of prostaglandin E$_2$ (PGE$_2$) had a significantly higher rate of cesarian section compared with women undergoing elective labor induction or women with spontaneous onset of labor.

Oftentimes, regular uterine contractions brought on by pitocin do not result in a successful labor induction (Byrd, 2001), causing unnecessary and unproductive pain for the parturient. Some general risks associated with synthetic oxytocin and/or prostaglandins include but are not limited to the following: diarrhea, chorioamnionitis, nausea, vomiting, increased rate of use of analgesia/anesthesia, neonatal amniotic therapy, NICU admission, and neonatal infection (Crane & Young, 2003).

**Control and Active Participation**

According to research, the number of elective labor inductions in the United States is increasing (Kirby, 2004; Kozak & Weeks, 2002; MacDorman, Mathews, Martin & Malloy, 2002; Zhang, Yancey & Henderson, 2002), and desire for feeling in control among laboring women is also increasing (Sears & Sears, 1994). It is unknown whether or not women opt for labor induction to feel a sense of control during childbirth. More research on the relationship between elective labor inductions and perception of control is needed.

Research in the area of childbirth and perception of control indicates that if a patient expects lack of control during intense medical situations, then the
patient is more likely to experience heightened distress, especially if the low expectation of control is paired with a high desire for control (Baron, Cusumano, Evans & Hodne, 2004). In addition, Green, Coupland & Kitzinger (1990) found that women who do not feel in control (internally or externally) are less likely to be satisfied, to be fulfilled, or to experience high postnatal emotional well-being regardless of antenatal desires or expectations of control. Green & Baston (2003) measured perception of control in relation to maternal satisfaction via a questionnaire with 1,146 women. The results showed that generally women feel more in control of what they do (internal control) rather than what the staff does (external control). Also, feeling in control of oneself and during contractions relates to pain relief and antenatal expectations of control. Conversely, feeling in control of staff relates primarily to comfort, feeling treated with respect and as an individual, and perceiving staff as considerate.

Ross (1998) theorizes that during childbirth, "control of pain rather than amelioration is seen by many to provide greater satisfaction." In contrast, perceived control has been found to affect variables such as arousal and anxiety, but research has shown that perceived control does not affect self-reports of pain (Thompson, 1981).

A sense of control paired with the use of familiar coping strategies may provide maternal satisfaction during the experience of labor. In interviews with 43 nulliparous women, Escott, Spiby, Slade & Fraser (2003) found that women usually use coping strategies that they have used in the past, and women may benefit from assistance in developing strategies that are based on knowledge of their own coping repertoire.

**Nonpharmacological Treatments**

Coping strategies utilized by women during childbirth often involve nonpharmacological treatments such as continuous labor support, hydrotherapy, intradermal water blocks, movement and positioning, touch and massage, acupuncture, hypnosis, TENS (transcutaneous electrical nerve stimulation), aromatherapy, heat and cold, childbirth education, self-help techniques, and
music and audioanalgesia (Simkin & Bolding, 2004). In a recent literature review of nonpharmacological treatments used to relieve labor pain and prevent suffering, Simkin & Bolding (2004) concluded that although nonpharmacological methods are not as effective for pain relief as epidural analgesia, they are comparable or even superior to parenteral opioids for reducing pain sensation; have few, if any, serious side effects, are inexpensive and easy to use; maintain or restore a sense of control to the woman; and contribute positively to the psychoemotional, spiritual, social and cultural aspects of the birth experience. Taking into account a woman’s familiarity with a coping strategy further qualifies these nonpharmacological methods (Escott, Spiby, Slade & Fraser, 2003).

The World Health Organization lists noninvasive nonpharmacological treatments as category A classification: “practices that are demonstrably useful and should be encouraged” (Larimore & Petrie, 2001). Specifically, the WHO classifies massage and relaxation techniques as category A. Although music therapy is not expressly listed in the WHO Classification of Practices in Normal Birth, it certainly serves as a noninvasive and often relaxing treatment during labor. Other nonpharmacological interventions such as herbs, immersion in water, and nerve stimulation are practices for which insufficient evidence exists to support a clear recommendation.

**Music & Obstetrics**

Research has shown that the use of music during obstetrical procedures and surgeries may reduce perceived anxiety and pain. A study by Shapiro and Cohen (1983) demonstrated benefits of stereophonic headphone music versus self-administered Methoxyflurane for pain relief during suction curettage procedures (abortion). According to the results of the study, while Methoxyflurane subjects tended to elicit an amnesic response to the procedure and less post-abortion cramping, subjects in the music group showed more improvement in pain relief and less complaint of pain than both the Methoxyflurane and control groups.
Cesarean section is another potentially anxiety-provoking obstetrical procedure for which music may be highly effective. In a survey of 109 patients who listened to preferred music through headphones during Cesarean birth, 75% reported the music to be “very beneficial,” while 80% of respondents reported the music as “very beneficial” on the second day of recovery (Goroszeniuk & Morgan, 1984). Stein (1991) found that music was not only statistically significant in reducing anxiety during Cesarean section, but preferred, recorded music was shown to be more effective during the most stressful part of the procedure (exteriorization of the uterus) compared to white noise and control groups.

Perhaps the earliest known published study with music and childbirth compared white noise (cascading waterfalls) to instrumental music. Utilizing post-questionnaires, McDowell (1964) found that music was more popular than white noise and the most pain relief was felt during contractions when the volume of the audioanalgesia (music, white noise, or both) was increased at the beginning of a contraction and decreased at the end of the contraction. Most of the women in the study reported that they would use audioanalgesia again; however, “women who were in an emotional state, apprehensive, and had little or no knowledge of childbirth, were unable to adapt to [the audioanalgesia].”

In the past few decades, researchers and clinicians have delineated several goals and objectives when using music in childbirth. Many goals addressed in the literature pertain to the psychological state of the mother: encouraging a more positive attitude toward motherhood, preparing the expectant mother for childbirth, inducing relaxation, reducing anxiety, facilitating a high level of maternal satisfaction, increasing sense of well-being, and reducing perceived pain (Gonzalez, 1989; McKinney, 1990). Other goals relate to family bonding and well-being of the fetus: increasing husband’s support, providing sensory stimulation for the fetus, pacifying the newborn, reducing fetal discomfort, and facilitating childcare tasks (e.g. breastfeeding) (Gonzalez, 1989). Finally, further goals address physiological effects of music: shortened labor, reduced obstetrical complications, and entrained breathing (McKinney, 1990).
Other considerations of music therapy-assisted childbirth include positive aspects of pregnancy. DiPietro, Ghera, Costigan & Hawkins (2004) suggest that “…focusing on the negative aspects of pregnancy may miss the positive psychological consequences” (p. 197). Federica & Whitwell (2001) assert that a music therapy in childbirth program should embrace both therapeutic and gratifying areas that are unique to pregnancy.

**Specific Music and Childbirth Literature**

Much of the music therapy in childbirth literature shows empirical evidence of the efficacy of music therapy. Behavioral observation is a particularly strong and specific type of evidence that has implications for relaxation and pain relief in labor. Codding (1982), one of the earliest researchers of music therapy in childbirth, studied the effects of music on fear, tension, and pain. There were no significant differences between music and control groups regarding post hoc reports of fear, tension, and pain, and the researcher did not analyze incomplete behavioral assessments; however, Codding adapted the Trippett Objective Muscle Relaxation Inventory (OMRI), a behavioral assessment appropriate for women experiencing labor pains, and researchers since have utilized this inventory. In a randomized, controlled study of 19 subjects, Browning (2001) used the OMRI and found that music significantly increased muscle relaxation behaviors, and individuals in the music group had a significantly higher perception of personal control.

Pioneers for research with music therapy and childbirth, Clark, McCorkle & Williams (1981) studied a group of women who, during several sessions before the onset of labor, practiced listening to preferred music with autogenic training, guided imagery and music, and progressive relaxation training. The researchers found a moderate correlation between music home practice and successful childbirth outcomes. Also, the experimental group achieved higher “success” scores on a questionnaire that included patient perceptions of pain, anxiety, passing of time, and support received.
Perhaps one of the most commonly measured variables in music and childbirth research is pain behaviors and perception. Observed pain behaviors and length of labor were significantly lower in the music group versus control group in a study of 31 women attending Lamaze classes (Winokur, 1984). Hanser, Larson & O’Connell (1983) found that subjects during the music condition had significantly lower Composite Pain Scores (as measured by behavioral observations) compared to the control condition. In addition, subjects during the music condition had fewer pain verbalizations and less inappropriate breathing during labor compared to the control condition.

Aside from behavioral changes, music has been shown to affect perception of pain, anxiety, and time during pregnancy and labor. Phumdoung & Good (2003) found music to delay the increase of affective pain for up to an hour during the active phase of labor. Of the 110 subjects in the study, the music group had significantly less self-reported sensation and distress of pain.

Liebman & MacLaren (1991) investigated the anxiolytic effects of music during adolescent pregnancies. The researchers conducted ten music therapy sessions that included listening to music while engaging in progressive muscle relaxation. According to the results, the music group reported significantly lower state anxiety on Spielberger’s State Trait Anxiety Inventory (STAI); however, significantly lower trait anxiety served as a limitation of the study (Liebman & MacLaren, 1991).

While describing pregnancy as a “time of crisis,” Frires (1985) found that music significantly shortens a laboring woman’s perception of time; hence, the “crisis” may not seem to last as long while listening to music.

Physiological effects of music therapy during labor pains were measured by Geden, Lower, Beattie & Beck (1989). The researchers used a labor pain-stimulating device and found that regardless of type or preference of music, heart rate and blood pressure decreased significantly for music groups versus control. An additional finding in the article suggests that women who are able to self-generate imagery during music may report a lower pain rating (Geden, Lower, Beattie & Beck, 1989). A more recent study suggests that relaxation as
measured by electromyography (EMG) and skin conductance level (SCL) significantly improves when engaged in progressive muscle relaxation while listening to music or white noise versus progressive muscle relaxation alone (Wiand, 1997).

Music has also been found to have an effect on the fetus. James, Spencer & Stepsi (2002) studied fetal heart rate and fetal activity between a music and control group. Though no statistical significance was reached, the music fetuses displayed a higher mean fetal heart rate, higher fetal heart rate variation, and a higher count of state transitions over time compared to the control group. In another study, Kisilevsky, Hains, Jacquet, Granier-Deferre & Lecanuet (2004) found that as gestational age increased, ability to attend to lower decibel levels increased. Also, fetuses of 33 weeks gestational age sustained a higher mean fetal heart rate with music.

Unlike many other populations with which music therapists work, a decrease in fetal heart rate is not an appropriate goal. The goal for heart rate of babies in utero is to maintain a reassuring fetal heart rate. No research indicates that music causes either a nonreassuring or ominous fetal heart rate.

Most techniques in the aforementioned paragraphs utilized some variation of engagement through music listening. Though research on active music-making in childbirth is limited, peripheral evidence indicates that research of this type may be worthy of investigation.

**Voice and Psychology**

Belin, Fecteau & Bedard (2004) delineate three distinct components of the voice: speech information, identity information, and affective information (i.e. phonation, timbre/pitch/volume, and emotion, respectively). As paralinguistic qualities of the voice are common among many different species, speech is the only unique quality to humans; therefore, the authors suggest that identity information and affective information of the voice have been far less investigated than speech.
A connection exists between the voice and emotions, and in fact, vocal fundamental frequency has been found to carry emotional information (Wittels, et al, 2002). Furthermore, a less critical perception of one's voice has been found to be associated with low social anxiety (Lundh, et al, 2002). Even regardless of language and culture, emotion can be detected and discerned through vocal expression. Scherer, Banse & Wallbott (2001) found that judges from 9 different countries, speaking 9 different languages could infer four different emotions and a neutral state from vocal portrayals with a high degree of accuracy; hence, vocal expression may be more universal than culture-specific. Gobl & Chasaide (2003) contend that the voice is emotionally loaded; voice quality tends to be associated with a “cluster of affective attributes” rather than to have a one-to-one specific connection with an emotion.

**Voice and Physiology**

Use of the voice has physiological implications as well. Single-breath humming exhalations (if performed after 3 minutes of silence) have been shown to increase the amount of nitric oxide in non-sinusitis subjects (Maniscalco, et al, 2003). Those who suffer from headache, rhinorrhea, and/or nasal congestion may benefit from humming (Weitzberg & Lundberg, 2002). A more recent study examined both the physiological and psychological effects of vocal production versus listening (Kreutz, et al, 2004). The researchers found that singing led to an increase in positive mood and an increase in secretory immunoglobulin A, a protein considered as the first line of defense against respiratory infections. Further research on the voice and psychophysiology indicates that singing may lead to a significant increase in secretory immunoglobulin A; in addition, singing may cause an increase in positive mood whereas listening may cause an increase in negative mood (Kreutz, et al, 2004). The act of toning has been investigated and compared to listening and singing among vocally-trained individuals. The results indicate that listening was the most efficacious condition when measuring heart rate, peripheral finger temperature, frontalis EMG,

With regards to the voice and newborns, research has shown that during the first few days of life, infants prefer the voice of the mother to all other stimuli (DeCasper & Fifer, 1980). In a study by Standley & Moore (1995), the researchers exposed premature infants to intervals of auditory stimuli via mother’s voice versus music for three consecutive days. Unlike the music babies, babies hearing the mother’s voice experienced no post-treatment depressed oxygen saturation levels, and oxygen saturation levels increased during treatment from Day 1 to Day 3.

Although clinicians currently practice sustained vocal production techniques such as toning with women in childbirth and achieve superb results based on anecdotal evidence (Pierce, 2001), no studies have quantitatively examined the efficacy of this particular music therapy technique in childbirth. The present study constitutes an attempt to determine the effect of music therapy on physiological measures, pain perception, and fatigue perception during early labor, using a sustained vocal production technique.
CHAPTER 2

PILOT STUDY

A pilot study was conducted to ascertain feasibility of the design of the study. Women in the study gave birth at a local hospital in North Florida. Music therapy sessions occurred in the subjects’ labor/delivery rooms. Each labor/delivery room was 22’ X 17’ in size with an adjoining bathroom; the rooms also included a birthing bed, rocking chair, adjustable sleeping sofa, bathroom with tub, window, and television.

The design utilized two experimental groups (N=40): music listening and toning. Dependent variables were labor state information; the subjects also self-reported pre- and post- pain and fatigue. The remaining objective physiological measurements of fetal heart rate (FHR) and uterine contraction intensity (UCI) were recorded from medical charts.

Participants in the study were nulliparous or multiparous labor-induced parturients. Inclusion criteria follow: normal full-term pregnancy, medically induced labor, cervical dilation less than or equal to 6 cm at admission, latent phase for no more than 10 hours, normal fetal heart rate, and normal fetal weight. Exclusion criteria follow: gestation period less than 37 weeks, history of psychiatric problems, major antipsychotic medication, difficulty hearing spoken word, past negative reactions while listening to music, and spontaneous membrane rupture for >20 hours. Subjects were English-speaking women of 18 years or older and were randomly assigned to one of two experimental groups: music listening (N=20) or toning (N=20). The groups were matched with regard to nulliparous or multiparous variables.
The data for both groups included pre- and post-measurements of self-reported pain and fatigue via a 100 mm Visual Analog Scale (Appendix G), duration of labor, and fetal heart rate. All physiological measurements were extracted from the subject’s medical record following delivery.

In addition, the subjects took part in a post discharge 5-minute interview (Appendix F). The researcher contacted each subject via telephone within three weeks following delivery for the post-discharge interview.

Prior to any interaction with potential subjects, the researcher obtained approval from the hospital Institutional Review Board (Appendix A) and the university Human Subjects Committee (Appendix C). In addition, a HIPPA waiver was obtained in order to allow the researcher to extract data from medical records (Appendix B). Following approval, the researcher recruited subjects directly through the hospital labor/delivery unit of the hospital. Patients made an appointment for labor induction with the unit coordinator on a particular day. The unit coordinator contacted the patients for admission on a room-availability basis throughout the day starting at 4:30 am. The researcher worked closely with the medical staff and was kept informed of the labor induction schedule each day.

All subjects met with the researcher upon admission and before the onset of labor to sign the consent form (Appendix D) and answer demographic and labor state questions (Appendix E). The researcher monitored fetal heart rate (FHR) and uterine contraction intensity, frequency, and duration using a continuous electronic fetal monitoring (EFM) device. When uterine contractions occurred as often as every 5 minutes or less, lasted no shorter than 40 seconds, and intensity of contractions was no less than 15 mm Mercury, the session began.

For subjects in the toning group, the researcher coached the subject in sustained vocal production (also known as “toning”), a technique wherein an elongated vowel or hum is vocalized during each exhalation. The researcher was present facilitating the technique for 20-30 minutes of regular contractions. The subject was informed that the inner vibrations and monotone quality of the technique could produce a calming effect. The researcher also indicated that
during a contraction, an increase in volume and pitch could produce a sense of control and active participation in the birthing process.

The researcher encouraged the subject’s support person(s) (if available) to participate in the technique with the subject. The researcher demonstrated how the subject and her support person(s) could use different vowels, pitches, vocal timbres, and volumes in order to produce the desired effect (such as calming, sense of control, relaxation, sense of power, confidence).

For subjects in the music listening group, the researcher engaged the subject in choosing preferred, live music that corresponded with feelings of relaxation, family bonding, and baby bonding. Preferred, live music has been shown to yield the greatest effects versus non-preferred, recorded music (Standley, 2000). The researcher encouraged the support person and/or family members (if available) to participate in the music decision-making as well.

The experimenter was present for 20-30 minutes of regular contractions, during which the experimenter provided live music and facilitated the subject’s song selection, breathing, moving, humming, and/or singing.

The researcher recorded the following data: self-reported pre- and post-pain and fatigue, mean baseline FHR, mean treatment condition FHR, mean baseline UCI, mean treatment condition UCI. The researcher extracted the following information from medical records following delivery: age, gestational age, duration of labor, medication intake, procedural information, and maternal remarks (Appendix E).

After executing the protocol of the study with five subjects, the researcher terminated the study due to unavoidable interferences that would have skewed results. The challenges of the protocol follow:

1) Patients undergoing treatment in the toning group often displayed signs of discomfort during the toning introduction and during the act of toning. Signs of discomfort included the following behaviors: positioning head and/or arms further away from the researcher, furrowing brow while looking at support person, chuckling with mouth closed, and refusal to participate.
2) In the presence of the patient, nursing staff often made statements pertaining to the “unusual” nature of toning.

3) The support person(s) often laughed and refused to participate.

There are several reasons that toning may not be appropriate to introduce to patients undergoing labor induction. Firstly, according to Payne (1995) and Pelletier (2004), relaxation techniques with which patients are unfamiliar may not be as effective as familiar techniques. The effectiveness of familiar techniques for relaxation may be transferred to techniques used to alter pain and fatigue perception. For instance, while listening to music is a common experience among most Americans, the act of music-making and toning is much less common. Perhaps meeting with parturients weeks in advance to practice toning and increase familiarity with the technique would yield better results.

Patients, support person(s), and/or nursing staff members also might have felt inhibited about his or her own vocal production which may have led to feelings of embarrassment. Again, meeting with parturients weeks in advance may prevent embarrassment. Through preparation, the expecting mother might develop a sense of control and active participation that would enhance the assumed benefits of the toning technique.

The researcher re-designed the thesis study to include music listening and control groups.
CHAPTER 3

METHOD

Design
Subjects were randomly assigned to either the music group (N=20) or control group (N=20). The independent variable was preferred, live music listening; the dependent variables were fetal heart rate (FHR), uterine contraction intensity (UCI), self-reported pain, and self-reported fatigue.

Subjects
Participants in the study were 40 nulliparous or multiparous labor-induced parturients. Inclusion criteria were the following: normal FHR, medically induced labor, and cervical dilation less than or equal to 6 cm at admission. Exclusion criteria included spontaneous membrane rupture for >20 hours. Subjects were English-speaking women over the age of 18 and were randomly assigned to either the music group (N=20) or control group (N=20). The groups were matched with regard to nulliparous or multiparous variables. Of the 40 women in the study, 13 were nulliparous and 27 were multiparous. Demographics of the subjects are listed in the table on the subsequent page. Table 1 includes demographic information and labor state information, and table 2 includes t-tests that reveal no significant difference between groups regarding demographic and labor state information.
Table 1

Demographic Information

<table>
<thead>
<tr>
<th></th>
<th>Music Group (N=20)</th>
<th>Control Group (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Age</td>
<td>27.55 years</td>
<td>6.245</td>
</tr>
<tr>
<td>Gestational Age</td>
<td>38.879 weeks</td>
<td>1.305</td>
</tr>
<tr>
<td>Duration of labor</td>
<td>11.432 hours</td>
<td>4.371</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Music Group (N=20)</th>
<th>Control Group (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparous (never given birth before)</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>Elective labor induction</td>
<td>60%</td>
<td>50%</td>
</tr>
<tr>
<td>Attended childbirth preparation classes</td>
<td>55%</td>
<td>40%</td>
</tr>
<tr>
<td>Use other therapies</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Have music training</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td>Have had negative experiences listening to music</td>
<td>0%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Labor state information

<table>
<thead>
<tr>
<th></th>
<th>Music Group (N=20)</th>
<th>Control Group (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
</tr>
<tr>
<td>Pain Tolerance</td>
<td>5.05</td>
<td>3.288</td>
</tr>
<tr>
<td>Relaxation</td>
<td>7.28</td>
<td>2.638</td>
</tr>
<tr>
<td>Fatigue</td>
<td>7.73</td>
<td>2.436</td>
</tr>
<tr>
<td>Fear</td>
<td>7.75</td>
<td>2.936</td>
</tr>
<tr>
<td>Happy</td>
<td>9.450</td>
<td>.8721</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Control Group (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Pain Tolerance</td>
<td>4.20</td>
</tr>
<tr>
<td>Relaxation</td>
<td>6.05</td>
</tr>
<tr>
<td>Fatigue</td>
<td>6.33</td>
</tr>
<tr>
<td>Fear</td>
<td>6.68</td>
</tr>
<tr>
<td>Happy</td>
<td>9.100</td>
</tr>
</tbody>
</table>
Table 2

Demographic and Labor State Independent Samples T-tests

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.213</td>
<td>38</td>
<td>.832</td>
</tr>
<tr>
<td>Gestational Age</td>
<td>-.848</td>
<td>38</td>
<td>.402</td>
</tr>
<tr>
<td>Duration of labor</td>
<td>.497</td>
<td>38</td>
<td>.622</td>
</tr>
<tr>
<td>Pain Tolerance</td>
<td>.869</td>
<td>38</td>
<td>.390</td>
</tr>
<tr>
<td>Relaxation</td>
<td>1.294</td>
<td>38</td>
<td>.204</td>
</tr>
<tr>
<td>Fatigue</td>
<td>1.563</td>
<td>38</td>
<td>.126</td>
</tr>
<tr>
<td>Fear</td>
<td>1.097</td>
<td>38</td>
<td>.280</td>
</tr>
<tr>
<td>Happy</td>
<td>1.050</td>
<td>38</td>
<td>.301</td>
</tr>
</tbody>
</table>

Dependent Measures

The data for both groups included pre- and post-measurements of self-reported pain and fatigue via 100 mm Visual Analog Scales, FHR, and UCI. The researcher recorded FHR and UCI immediately following the treatment.

Procedure

Prior to any interaction with potential subjects, the researcher obtained approval from the hospital Institutional Review Board (Appendix A) and the university Human Subjects Committee (Appendix C). In addition, a HIPPA waiver was obtained to allow the researcher to extract data from medical records (Appendix B).

Patients made a labor induction appointment with the unit coordinator for a particular day. The unit coordinator contacted the patients for admission on a room-availability basis throughout the day starting at 4:30 AM. The researcher worked closely with the medical staff and was kept informed of the labor induction schedule each day. The researcher approached the potential subjects regarding participation in the study upon admission to the hospital.

Both control and music group subjects participated in a demographic and labor state interview (Appendix E) upon admission.

After patients signed the consent form (Appendix D), the researcher monitored progress of uterine contractions using a continuous electronic fetal
monitor (EFM). When uterine contractions occurred every five minutes or less, had duration of 40 seconds or more, and amplitude was no less than 15 mm Mercury, the conditions (music or control) began.

**Music Listening**

The researcher engaged the subject in choosing preferred, live music that corresponded with feelings of relaxation, family bonding, and baby bonding. Preferred, live music has been shown to yield the greater effects versus non-preferred, recorded music (Standley, 2000). The researcher encouraged the support person and/or family members (if available) to participate in the music decision-making as well. The researcher was present engaging the subject in music listening for 20-30 minutes.

**Control Group**

The control group did not receive any treatment during regular uterine contractions.

**Data Collection**

For all subjects, the researcher collected self-reported pre- and post- pain and fatigue via 100mm Visual Analogue Scales (Appendix G). Also for all subjects, physiological data (FHR and UCI) were collected pre- and at the end of each of two 20 minute periods: first period without intervention and second period with intervention among the music group subjects (Appendix H). The researcher extracted the following information from medical records following delivery: age, gestational age, duration of labor, medication intake, procedural information, and maternal remarks (Appendix E).
CHAPTER 4

RESULTS

An initial N of 45 was reduced to 40 following completion of data collection. One subject in the music group requested termination of the session due to discomfort. Medical staff entered the room of two subjects during data collection in order to perform an artificial rupture of membranes (AROM). During AROM, an external fetal heart rate monitor is replaced with an internal fetal heart rate monitor; therefore, data were inconsistent. Two subjects were removed from data collection due to serious medical complications caused by hypertension.

Independent samples t-tests revealed no significant differences in demographic information between the music and control groups: age, gestational age, and duration of labor. Also, no significant differences between groups were revealed with regard to labor state: pain tolerance, relaxation, fatigue, fear, and happiness (Table 2).

Means and standard deviations for FHR are shown in Table 3. Two-way analysis of variance for FHR by time of measurement (F=1.664, df=2, p=.196), and for time by groups revealed no significant difference (F=1.557, df=2, p=.217).
Table 3

FHR Comparison by groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline Mean</th>
<th>Baseline SD</th>
<th>20' Baseline Mean</th>
<th>20' Baseline SD</th>
<th>20' Post Mean</th>
<th>20' Post SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music (N=20)</td>
<td>137.65</td>
<td>9.917</td>
<td>137.45</td>
<td>9.093</td>
<td>135.20</td>
<td>9.897</td>
</tr>
<tr>
<td>Control (N=20)</td>
<td>138.00</td>
<td>11.337</td>
<td>141.95</td>
<td>14.659</td>
<td>139.60</td>
<td>14.720</td>
</tr>
</tbody>
</table>

Means and standard deviations for UCI are shown in Table 4. Two-way analysis of variance for UCI by time of measurement (F=.584, df=2, p=.560) and for time by group revealed no significant difference (F=.845, df=2, p=.434).

Table 4

UCI Comparison by groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline Mean</th>
<th>Baseline SD</th>
<th>20' Baseline Mean</th>
<th>20' Baseline SD</th>
<th>20' Post Mean</th>
<th>20' Post SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music (N=20)</td>
<td>46.10</td>
<td>14.045</td>
<td>47.20</td>
<td>11.723</td>
<td>49.45</td>
<td>12.107</td>
</tr>
<tr>
<td>Control (N=20)</td>
<td>42.80</td>
<td>10.511</td>
<td>42.50</td>
<td>13.024</td>
<td>42.45</td>
<td>12.890</td>
</tr>
</tbody>
</table>

Means and standard deviations for self-reported pain and fatigue are shown in Table 5. Two-way ANOVA for both pain and fatigue by time of measurement revealed significantly lower self-reported pain for the music group (F=11.278, df=1, p=.002) and significantly lower self-reported fatigue for the music group (F=17.300, df=1, p=.000).
### Table 5

#### Pain Comparison by Groups

<table>
<thead>
<tr>
<th></th>
<th>20' Baseline</th>
<th></th>
<th>20' Post</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Music (N=20)</td>
<td>42.83</td>
<td>33.224</td>
<td>31.80</td>
<td>32.367</td>
</tr>
<tr>
<td>Control (N=20)</td>
<td>39.00</td>
<td>31.641</td>
<td>52.85</td>
<td>28.865</td>
</tr>
</tbody>
</table>

#### Fatigue Comparison by Groups

<table>
<thead>
<tr>
<th></th>
<th>20' Baseline</th>
<th></th>
<th>20' Post</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Music (N=20)</td>
<td>26.85</td>
<td>29.795</td>
<td>16.75</td>
<td>20.991</td>
</tr>
<tr>
<td>Control (N=20)</td>
<td>20.98</td>
<td>26.295</td>
<td>30.00</td>
<td>33.228</td>
</tr>
</tbody>
</table>

It should be noted that Table 4 shows that monitor readings of UCI indicated a trend for stronger contractions in the music group, though this was not significant; the music group also indicated greater perceived pain during baseline measurement. Despite these differences, the music group perceived significantly less pain during the intervention interval. Data in Table 5 also indicate a strong relationship between perceived pain and perceived fatigue.
CHAPTER 5

DISCUSSION

The current study examined the effects of music therapy on physiological and perceptive measurements among labor-induced parturients. Results of this study reveal several notable implications for further research and clinical practice in the area of music therapy and childbirth. Firstly, it is important to note that there was no significance between groups regarding demographic and labor state information; thus, there were no problems with randomization.

No significance was found regarding fetal heart rate. This may be due to room environment and setup of the sessions. Due to guests in the room or various noninvasive procedures taking place, the researcher did not control for proximity of the music to the mother within the music group. The fetuses may have been receiving music at different decibel levels. Also, due to the stated preference of the mother, type of music was different per subject.

Statistical analysis showed significantly lower pain perception in the music group compared to the control group. This finding is important for health care professionals; music may be an effective treatment for women who have trouble coping with pain sensation. During a music session, a friend of one subject in the study stated, “You just laughed through that contraction. You were screaming through the last contraction that was just as strong!”

Also, a significantly lower perception of fatigue was found in the music group. This may also be important for health care professionals as elective labor induction, which is riskier than spontaneous onset (Glantz, 2005), may be pursued due to maternal exhaustion (Byrd, 2001). However, the design of the current study may lend itself to error in perception measurements due to the
concurrent measurements of pain and fatigue. This study shows that patients may associate pain with fatigue and vice versa. More research is needed to separate the two perception variables or to verify that clinically one measurement is sufficient to assess both issues.

Measurements in this study encompassed a very short time (20-30 minutes) relative to the entire process of labor and childbirth. Researchers in the future may consider extending the treatment condition over a longer period of time and possibly covering time closer to delivery when the pain sensations are stronger. Also, long-term effects of music therapy in childbirth warrant further research. One subject in the study attested to long-term effects of music by stating, “The thing about music is that it stays with you even when it stops. It is still in your mind.”

Future researchers may also consider meeting with parturients weeks in advance for proper preparation with music. According to Payne (2001), a person is less likely to achieve relaxation with an unfamiliar technique. Therefore, preparation and practice prior to labor may be more effective with music listening.

Other considerations for future research include accounting for cervical dilation measurements, investigating overt behaviors, and examining the effects of music therapy on women who have a spontaneous onset of labor. Music therapy techniques other than preferred, live listening should be examined in the future as well. One author even reports, by casual observation and technique description, ease of comforting movements through drumming during labor (Dye, 2003). Toning, improvisation, active music-making, music-assisted imagery, and entrainment for breathing are techniques for which the effectiveness in childbirth is relatively unknown. Future studies may consider utilizing the aforementioned techniques and examining respective physiological measures, pain perception, perception of control, and/or relaxation levels of women in labor.
APPENDIX A

Tallahassee Memorial HealthCare Institutional Review Board Approval
May 13, 2005

Kathryn B. Fulton
P.O. Box 2473
Tallahassee, FL 32316

Dear Ms. Fulton:

I have reviewed your study entitled, "The Effect of Sustained Vocal Production Technique versus Preferred Music Listening on Women in Labor". I find that the study meets the criteria for an Expedited Review and upon receipt of this letter you may proceed with your study. The IRB Record of Approval of Requested Waiver (HIPAA) is attached.

The expiration date of this approval is May 13, 2006, one year from the approval date. If your study will not be completed by that date, you will need to submit to the TMH IRB an application for continuation review and approval 2 months in advance of the expiration date. You will also need to request from the TMH IRB approval to make any amendments to this study protocol.

Please provide a copy of your completed results to the Medical Staff Office at Tallahassee Memorial HealthCare so that the results can be archived and presented to the Institutional Review Board.

Sincerely,

Richard I. MacArthur, M.D., MS
Administrative Liaison/IRB

c: IRB# 39

Attachment
APPENDIX B

HIPAA Waiver
## Approval Record of Approval of Requested Waiver

**Tallahassee Memorial Healthcare, Inc.**

**IRB Record of Approval of Requested Waiver**

**Approval Record**

*For IRB Use Only*

IRB Protocol No: 

<table>
<thead>
<tr>
<th>Reviewed by:</th>
<th></th>
<th>Convened IRB</th>
<th></th>
<th>IRB Chair or Vice Chair pursuant to expedited procedures</th>
</tr>
</thead>
</table>

1. **The use or disclosure of protected health information involves:**
   *MINIMAL RISK* to individual privacy.
   *MORE THAN MINIMAL RISK* to individual privacy.

2. **There is**
   - [ ] IS NOT a plan to protect identifiers from improper use/disclosure.

3. **There is**
   - [ ] IS NOT a plan to destroy identifiers at the earliest opportunity.

4. **There are**
   - [ ] ARE NOT adequate written assurances that information will not be reused/redisclosed.

5. **The research**
   - [ ] COULD NOT be conducted without the waiver or alteration.

6. **The research**
   - [ ] COULD be conducted without the protected health information.

The request for waiver or alteration of authorization is:

- [ ] Not Approved
- [x] Approved as a Waiver (the first box must be checked for all the elements above)
- [ ] Approved as an Alteration (description of nature of alteration required):

![Signature and Date]

**Larry C. Deeb, MD, Chair**

**Date**

---

**Page 5 of 5**
APPENDIX C

Florida State University Human Subjects Approval
 APPROVAL MEMORANDUM (for change in research protocol)

Date: 7/7/2005

To: Kathryn Fulton
PO Box 2473
Tallahassee FL 32316

Dept: MUSIC SCHOOL

From: Thomas L. Jacobson, Chair

Re: Use of Human subjects in Research
Project entitled: The of sustained vocal production technique versus preferred music listening on physiological measures, perceived pain and fatigue, and observed behaviors of women during the active phase of labor

The memorandum that you submitted to this office in regard to the requested change in your research protocol for the above-referenced project have been reviewed and approved. Thank you for informing the Committee of this change.

A reminder that if the project has not been completed by 5/10/2006, you must request renewed approval for continuation of the project.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

cc: Jayne Standley
APPLICATION NO. 2005.379
APPENDIX D

Informed Consent Form
Informed Consent Form

Kathryn Fulton is conducting this research. She is a graduate student under the study of Dr. Jayne Standley in the School of Music at Florida State University. I understand that the purpose of this study is to research the effects of music therapy on objective measures, pain, and fatigue during labor.

I understand that my involvement in the study will require a five-minute interview before treatment. I am also required to participate in a ten-minute interview within a week after childbirth. I will be randomly assigned to one of the three groups that follow:

1. Music Group. I understand that I will participate in an hour-long session two hours after induction. During the session, the music therapist will play my preferred music. The purpose of the music is to elicit relaxation and a sense of normalcy in the hospital. The researcher will encourage my support person(s) to participate in the music choice, too.

2. No Contact Control Group. I understand that I will not receive music therapy sessions during labor. I will receive relaxing CDs three hours after induction.

I understand that the researcher will ask me to rate my pain twice. I also understand that the researcher will extract my name, phone number, frequency and amplitudes of labor pains, fetal heart rate, duration of labor, and medication data from my medical record.

I understand that my participation is totally voluntary. I may stop participation at any time. My name will not appear on any results. I understand that my demographic and recorded information will be paired with a number that will reside with the researcher. The facility is the only holder of my name and number. I understand that all information will be destroyed by May 1, 2007. Information obtained during the course of this study will remain confidential to the extent allowed by law. There are no foreseeable risks or discomforts as I agree to participate in this study.

I understand that there is a possibility of minimal risk if I agree to participate in this study. I might experience increased pain or anxiety during labor. However, participation in this study in no way interrupts the standard care and treatment that my doctor and nurses will continue to provide. Attending medical staff members will be available to talk with me about any discomfort. I am able to stop my participation any time I wish. I understand that there are benefits for participating in this research project. My own awareness about my health may increase. I may learn coping strategies for labor pain. Also, I will be providing health care professionals with valuable information about childbirth strategies. This knowledge can assist them in providing services that help expecting mothers stay healthy.

I understand that this consent may be withdrawn at any time. If I withdraw, there will be no prejudice, penalty or loss of benefits to which I am otherwise entitled. I have been given the right to ask and have answered any inquiry about the study. Questions have been answered to my satisfaction.

I understand that I may contact Dr. Jayne Standley, Florida State University and School of Music, (850) 644-4565, or the researcher Kathryn Fulton, (850) 980-7080, for answers to questions about this research or my rights. Group results will be sent to me upon request.

I understand that if I have any questions about my rights as a participant in this research, or if I feel I have been placed at risk, I can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research at (850) 644-8633.

I have read and understand this consent form. I consent that I am 18 years of age or older.

(Subject’s Signature) (Date)

(Subject’s Printed Name)
APPENDIX E

Demographic and Labor State Information
Subject Number: ________

DEMOGRAPHIC INFORMATION
Age:____
Is this your first pregnancy? OYes  ONo
How many live births have you had in the past? _____
Have you ever attended childbirth preparation classes? OYes  ONo
Are you receiving any alternative/complementary therapies (massage, acupuncture, hypnosis, aromatherapy, etc.)? OYes  ONo
If Yes, what kind? _______________________________________________________
Have you ever had formal music training? OYes  ONo
Have you ever had negative experiences listening to music? OYes  ONo

LABOR STATE INFORMATION
How tolerant are you to pain?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not tolerant at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Extremely tolerant</td>
</tr>
</tbody>
</table>

What level of relaxation do you feel right now?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No anxiety at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Extreme anxiety</td>
</tr>
</tbody>
</table>

In general, what level of fatigue do you feel right now?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fatigue at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Extreme fatigue</td>
</tr>
</tbody>
</table>

How fearful do you feel about your pregnancy?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not fearful at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Extremely fearful</td>
</tr>
</tbody>
</table>

How happy are you about your pregnancy?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
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<tbody>
<tr>
<td>Not happy at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Extremely happy</td>
</tr>
</tbody>
</table>

EXTRACTED INFORMATION FROM MEDICAL RECORDS
Start time of measurements:
Gestational Age:____
Start Time of Pitocin drip:____
Duration of Labor:____
Cervidil: Y  N
AROM:  Y  N
Epidural:  Y  N
Episiotomy:  Y  N

Maternal Remarks:
APPENDIX F

Post-Interview (Pilot Study only)
Subject Number: _____

Please rate your tolerance to pain.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least tolerant</td>
<td>Most tolerant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How was your level of relaxation during delivery?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least relaxed</td>
<td>Most relaxed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

How was your level of fatigue during delivery?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least fatigued</td>
<td>Most fatigued</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How was your level of fear during delivery?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least fear</td>
<td>Most fear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How was your level of happiness during delivery?

<table>
<thead>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least happy</td>
<td>Happiest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Did you find the music/toning beneficial?

Would you use music/toning again?

Do you have further comments?
APPENDIX G

Visual Analogue Scale
<table>
<thead>
<tr>
<th>No Pain Relief</th>
<th>Complete Pain Relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Fatigue</td>
<td>Total Fatigue</td>
</tr>
</tbody>
</table>
APPENDIX H

Fetal Heart Rate and Uterine Contraction Intensity Data Collection Form
Subject Number:_______

FHR A:_____  UCI A:_____  
FHR B:_____  UCI B:_____  
FHR C:_____  UCI C:_____  

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REFERENCES


BIOGRAPHICAL SKETCH

Kathryn Fulton was born in Atlanta, Georgia on April 4, 1979. She graduated *cum laude* with a Bachelor of Music Degree in Piano Performance and Music Theory from Furman University (Greenville, SC) in 2001. She was awarded an assistantship and began music therapy studies at Florida State University (Tallahassee, FL) in 2002. In the spring of 2005, she successfully completed an internship at MusicWorx of California, a contracting and consulting music therapy agency located in San Diego. Her primary interests are medical music therapy and business development.