THE EFFECT OF MUSIC THERAPY ON ANXIETY, PHYSIOLOGICAL RESPONSES, AND WEANING PARAMETERS IN PATIENTS DURING WEANING FROM MECHANICAL VENTILATION

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Jiraporn Chontichachalalauk

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ABSTRACT

Weaning from mechanical ventilation may increase anxiety in patients, which, in turn, may induce physiological responses. From a literature review, music therapy has shown to decrease anxiety and increase relaxation in various populations. However, these effects have not been examined in patients during weaning from mechanical ventilation. The purpose of this study was to examine the effect of music therapy on anxiety, physiological responses, and weaning parameters in patients during weaning from mechanical ventilation. The sample consisted of 20 patients during weaning from mechanical ventilation at three intensive care units of a university hospital, Bangkok, Thailand. Purposive sampling was used to recruit the sample.

A crossover experimental design was used to compare the mean changes in anxiety, physiological responses, and weaning parameters between the subjects in an intervention period—a period when the patients received 30 minutes of music—and in a control period without music. The sequence of these periods for each subject was randomly assigned by drawing lots. For both periods, the anxiety level was assessed, and physiological responses (heart rate, respiratory rate, and blood pressure) and weaning parameters (oxygen saturation, tidal volume, and rapid shallow breathing index) were measured.

The tests showed that the anxiety level, respiratory rate, and mean arterial pressure during the music therapy period were decreased more than during the control period over time, while there was no significant difference as regards other physiological responses and the weaning parameters.

In conclusion, this study showed that music therapy can help in the process of weaning patients from mechanical ventilation because it reduces anxiety level and some physiologic responses. These outcomes indicate that music therapy can promote relaxation responses in patients during weaning from mechanical ventilation, which in turn, may help the patients to conserve their energy and to promote their recovery.

KEYWORDS: MUSIC THERAPY /ANXIETY/ PHYSIOLOGICAL RESPONSES/ WEANING PARAMETERS / MACHANICAL VENTILATION

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ผลของดนตรีบำบัดต่อความวิตกกังวล การตอบสนองทางสรีระและตัวแปรในการหย่าเครื่องช่วยหายใจในผู้ป่วยระหว่างหย่าจากเครื่องช่วยหายใจ (THE EFFECT OF MUSIC THARAPY ON ANXIETY, PHYSIOLOGICAL RESPONSES, AND WEANING PARAMETERS IN PATIENTS DURING WEANING FROM MECHANICAL VENTILATION)

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บทคัดย่อ

การหย่าจากเครื่องช่วยหายใจอาจจะมีส่วนทำให้ผู้ป่วยที่อยู่ในระหว่างหย่าจากครื่องช่วยหายใจเกิดความวิตกกังวลและมีผลต่อการตอบสนองทางสรีระ จากการทบทวนวรรณกรรม ดนตรีบำบัดมีบทบาทในการลดความวิตกกังวล และเพิ่มการผ่อนคลายในประชากรกลุ่มต่างๆ แต่ยังไม่พบงานวิจัยที่ศึกษาผลของดนตรีบำบัดในผู้ป่วยที่หย่าจากเครื่องช่วยหายใจ จุดมุ่งหมายของงานวิจัยในครั้งนี้เพื่อศึกษาผลของดนตรีบำบัดต่อความวิตกกังวล การตอบสนองทางสรีระและตัวแปรในการหย่าเครื่องช่วยหายใจในผู้ป่วยระหว่างการหย่าเครื่องช่วยหายใจ กลุ่มตัวอย่างคือผู้ป่วยที่หย่าจากเครื่องช่วยหายใจในหอผู้ป่วยวิกฤตของโรงพยาบาลรามาธิบดี 3 แห่ง โดยเลือกลุ่มตัวอย่างแบบเฉพาะเจาะจงตามเกณฑ์ที่กำหนด จำนวน 20 ราย

การออกแบบงานวิจัยในครั้งนี้ผู้ป่วยทุกรายเป็นกลุ่มควบคุมในตนเองเพื่อเปรียบเทียบความวิตกกังวล การตอบสนองทางสรีระและตัวแปรในการหย่าจากเครื่องช่วยหายใจที่เปลี่ยนแปลงไปของผู้ป่วยระหว่างระยะทดลองซึ่งผู้ป่วยจะได้รับฟังดนตรีนาน 30 นาที และในระยะควบคุมผู้ป่วยจะไม่ได้รับฟังดนตรี ลำดับก่อนหลังของทั้ง 2 ระยะใช้การจับฉลาก วัดความวิตกกังวล, การตอบสนองทางสรีระ (อัตราการเต้นหัวใจ, อัตราการหายใจ, และความดันโลหิต)และตัวแปรในการหย่าเครื่องช่วยหายใจ (Oxygen saturation, Tidal volume, and Rapid shallow breathing index) ทั้ง 2 ระยะ

ผลการศึกษาพบว่าขณะที่ได้รับฟังดนตรีบำบัดผู้ป่วยมีความวิตกกังวล อัตราการหายใจและความดันเฉลี่ยของหลอดเลือดแดงลดลงมากกว่าขณะไม่ได้รับดนตรีบำบัดอย่างมีนัยสำคัญทางสถิติ ในขณะที่ตัวแปรอื่นของการตอบสนองทางสรีระและตัวแปรในการหย่าเครื่องช่วยหายใจของผู้ป่วยขณะที่ได้รับฟังดนตรีบำบัดและขณะไม่ได้รับดนตรีบำบัดไม่มีความแตกต่างกันอย่างมีนัยสำคัญสรุปผลจากการวิจัยนี้ ดนตรีบำบัดสามารถช่วยลดความวิตกกังวลและการตอบสนองทางสรีระบางอย่างในผู้ป่วยขณะหย่าเครื่องช่วยหายใจได้ โดยผลที่ได้จาการศึกษาครั้งนี้บ่งชี้ให้เห็นว่าดนตรีบำบัดส่งเสริมให้เกิดภาวะผ่อนคลายในผู้ป่วยขณะหย่าจากเครื่องช่วยหายใจซึ่งอาจจะช่วยสงวนพลังงานให้กับผู้ป่วยและส่งเสริมการฟื้นฟูสภาพได้

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CHAPTER I
INTRODUCTION

Background and Rationale

Intubation and mechanical ventilation are often required for the patients with the critical conditions such as respiratory failure or major surgery (Menzel, 1998: 245). Mechanical ventilation is a major life-support modality during respiratory failure. Once the illness that precipitates respiratory failure has been resolved or improved, mechanical ventilation can be discontinued or weaned (Chao & Scheinhorn, 1998: 799).

Weaning from mechanical ventilation is a way to help patients who rely on mechanical ventilator support to breathe by themselves. This process is a stressful transitional period of critical patients from illness to recovery (Bridges, 1992: 14). Evaluation of weaning readiness should be concerned with the patient's physiological condition, psychological condition, and the method of weaning. When a patient has stable physiological and psychological conditions, weaning should be performed.

During the weaning phase, the patient basically puts effort of breathing to meet adequate demands within multifaceted environments in the critical care unit. These factors can affect both physiological and psychological aspects such as the experience of fatigue (Higgins, 1998: 177-183; Logan & Jenney, 1997: 140-147), dyspnea (Bouley et al., 1992: 471-476; Logan & Jenney, 1997: 145), and negative emotions including insecurity, fright or frustrated situations, fear of dying, depression, and anxiety (Logan & Jenney, 1997: 140-147).

The process of weaning from mechanical ventilation may increase psychological factors such as anxiety and fear (MacIntyre, 1995: 278). Patients' anxiety may be increased, while the ventilator is withdrawn, because of increased shortness of breath, and a fear of death, and abandonment (MacIntyre, 1995: 278). These factors may induce physiological distress by stimulating the sympathetic nervous system (Grossbach-Landis, 1980: 57-58). Accordingly, bronchoconstriction and tightening of

chest muscles may occur and result in increasing airway resistance, breathing effort, and increasing energy requirement. Shortness of breathing will occur when the body system compensate inadequately, which, in turn, induces anxiety (Blackwood, 2000: 147; Grossbach-Landis, 1980: 57-58). Because there is an intimate and complex interconnection between the mind and the body in the holistic model, physiological and emotional changes are reciprocal (Dossey, 1992: 17).

Based on the notion of the mind-body connection, nurses play a role in assessment of the readiness of patients for weaning, both physiological and psychological conditions. Providing information for patients to understand the weaning process and supporting them to feel secured and confident in weaning are essential. The incorporated intervention is based on a holistic approach such as cognitive therapies. These interventions have been found to improve the effectiveness of weaning (Corson et al., 1979; Holliday & Hyers, 1990; LaRiccia et al., 1985; Treggiari-Venzi et al., 2000) because they may reduce stress response.

Examples of the cognitive therapies include relaxation technique, imagery, biofeedback, and music therapy. However, some of these methods (e.g., imagery and biofeedback) are difficult to practice, and the patients must actively participate, whilst the patients in a critical condition have low energy. Therefore, music therapy is considered an appropriate complementary intervention during the weaning period.

Music therapy is “behavioral science concerned with the systemic application of music to produce relaxation and desired changes in emotions, behavior, and physiology” (Guzzetta, 1995: 670). The advantage of music, as a complementary therapy, is a simple, non-invasive, and non-threatening method. In a literature review, it was found that in various clinical settings, music is used to minimize stress and to promote relaxation by reducing activities of the sympathetic nervous system; for example, decreasing the anxiety level (Chlan, 1998; Kaempf & Amodei, 1989; Lueders-Bolwerk, 1990; Puang-Ngern, 2001; Watkins, 1997; Wong et al., 2001), respiratory rate, muscle tension (Benson, 1975), dyspnea (McBride et al., 1999), blood pressure, and heart rate (Benson, 1975; Watkins, 1997), as well as body metabolism (Benson, 1975).

To date, the literature regarding the effect of music therapy on patients’ anxiety and physiological responses during weaning from mechanical ventilation has never

been reported. However, the literature stating that music can reduce physiological and psychological responses among patients in the various settings lends support to the notion that music may promote relaxation and reduce anxiety in patients during weaning from mechanical ventilation. The present study may fill the existing gap in the literature regarding the effect of music therapy on health.

Purpose of the Study

The purpose of this study is to examine the effect of music therapy on anxiety, physiological responses, and weaning parameters in patients during weaning from mechanical ventilation.

Conceptual Framework

The framework of this study was based on the concept of the interconnection of mind and body stating that there are reciprocal changes of physiological and psychological responses (Dossey, 1992: 17). A conceptual framework for this study is synthesized from the literature (Benson, 1975; Grossbach-Landis, 1980; Wells-Federman et al., 1995). In Figure 1, weaning from mechanical ventilation, physical impairment, and stress in the critical environment are perceived as stressful events that may induce patients' anxiety. Weaning from mechanical ventilation may be a factor that produces psychological responses (e.g., anxiety), which, in turn, links to physiological responses (e.g., increased shortness of breath) (Grossbach-Landis, 1980: 57-58).

Music therapy is proposed as a complementary intervention to help patients during weaning from mechanical ventilation to promote relaxation and reduce anxiety. When musical sound falls in the ear, the auditory nerve transmits information in the form of action potential from the inner ear to the brainstem (Tramo, 2001: 54). The neuronal coding of music along with the auditory neural pathways passes to the medial geniculate nucleus, where all the fibers synapse in the thalamus before they reach the auditory cortex located mainly in the superior gyrus of the temporal lobe (Guyton, 1986: 740-741). The parts of the auditory cortex are connected with other cortical areas of the cerebral cortex; therefore, these pathways bring music to the parts of the

brain and then induce physiological and behavioral changes in the brainstem (Tramo, 2001: 54-55).

That music therapy decreases anxiety and improves relaxation response is supported by the concept of the body-mind interconnection, which can be explained in continuous communication through three major systems including the autonomic nervous system, the psychoneuroendocrine system, and the musculoskelatal system (Wells-Federman et al., 1995: 60). Music therapy induces psychophysiologic relaxation responses by integrating functions of the limbic-hypothalamic system that leads to a generalized decrease in central nervous system arousal (Wells-Federman et al.,1995: 61). The limbic system is the center of control of emotional behavior, feeling, and sensations in the cerebral cortex (Guzzetta, 1995: 674-676; Willis, 1993: 258), while the hypothalamus is the regulatory center of the autonomic nervous system, coordinating the biochemical cascade, integrating neuroendocrine functions, controlling homeostasis, and providing continuous feedback between mind and body (Guyton, 1986: 676-678; Wells-Federman et al., 1995: 60). The limbic system and hypothalamus are related structure and mainly function together as a total system. Many functions of the nervous system from the hypothalamus and from other limbic structures are mediated through the reticular formation of the brain stem (Guyton, 1986: 676-677).

The autonomic nervous system controls the visceral functions of the body, such as arterial pressure, heart rate, and respiration. When music leads to a generalized decrease of central nervous system arousal, signals from the hypothalamus and the cerebrum transmit to autonomic control centers of the brain stem, which, in turn, decreases sympathetic nervous system activities. Epinephrine and norepinephrine, which are secreted from adrenal medullae, are related to stimulation of the sympathetic nerves. The secretion of these two hormones decrease in the blood circulation, resulting in lower heart rate, blood pressure, and respiratory rate (Guyton & Hall, 2000: 697-708; Wells-Federman et al., 1995: 60-61).

Music provides a means to decrease anxiety. This can be explained that processing of musical sound takes place in the auditory cortex and transmits through the limbic system to the psychoneuroendocrine system of hypothalamic-pituitary-adrenal axis, which stimulates endorphin release (Wells-Federman et al., 1995: 60).

Once at the limbic system, which is related to emotion response, impulse of musical neural provides an immediate reward experience through the activation of the brain-reward center in the limbic system, resulting in stimulating the release of endorphins, which acts on specific receptors in the brain to alter emotion and also decrease anxiety (Guzzetta, 2000: 590; Thaut, 1990 cited in Chlan & Tracy, 1999: 36).

Processing of musical sound takes place at the auditory cortex, which leads to generalized decrease in central nervous system arousal. Neural messages of music sound are transduced through the nervous system via motor pathways to decrease muscle tension and rigidity. The musculosketal system also relaxes by decreasing the sympathetic nervous system activity (Wells-Federman et al., 1995: 60-61). The relaxation response leads to a decrease in tightening of chest muscle, and possible decrease in bronchoconstriction, resulting in decreased work of breathing, airway resistance, and energy requirements of patients during weaning from mechanical ventilation. During the relaxation response, deep breathing and decreased respiratory rate will improve tidal volume and also improve gas exchange, which is evidenced by improved oxygen saturation. Therefore, during the weaning phase, patients must increase work of breathing to meet adequate demand, and music therapy inducing relaxation response helps them to maintain adequate oxygenation and ventilation.

Objective

To test the effect of music therapy on the mean changes of the anxiety level, physiological responses, and weaning parameters of patients weaning from mechanical ventilation between the two periods: during the music therapy period and during the uninterrupted rest period without music therapy.

Research Hypotheses

1. The anxiety level of patients weaning from mechanical ventilation during the music therapy period decreases more than during the uninterrupted rest period without music therapy.

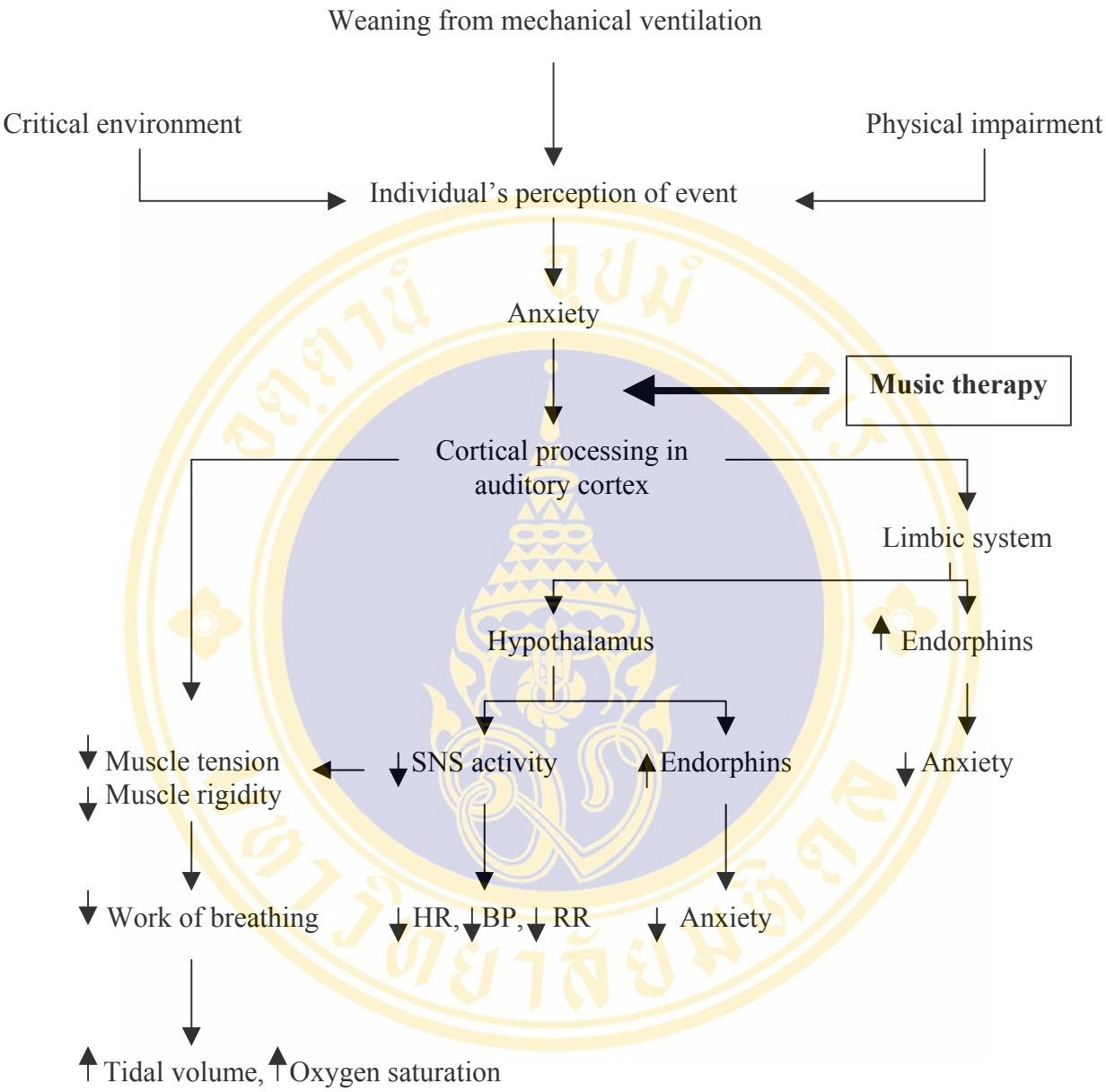

Figure 1. Conceptual framework of this study (Modified from Benson, 1975; Grossbach-Landis, 1980: 57-58; Wells-Federman, et al., 1995: 60-61).

Note: SNS = sympathetic nervous system, HR = heart rate, BP = blood pressure, RR = respiratory rate

Research Hypotheses (Continued)

2. Physiological responses (heart rate, blood pressure, and respiratory rate) of patients weaning from mechanical ventilation during the music therapy period decrease more than during the uninterrupted rest period without music therapy.

3. Weaning parameters (oxygen saturation, tidal volume, and rapid shallow breathing index) are hypothesized separately as follows:

3.1 Oxygen saturation of patients weaning from mechanical ventilation during the music therapy period increases more than during the uninterrupted rest period without music therapy.

3.2 Tidal volume of patients weaning from mechanical ventilation during the music therapy period increases more than during the uninterrupted rest period without music therapy.

3.3 Rapid shallow breathing index of patients weaning from mechanical ventilation during the music therapy period decreases more than during the uninterrupted rest period without music therapy.

Definition of Variables

Music therapy: Music therapy is defined as a relaxing music intervention. In this study, music therapy includes melodies of the natural sound, either the sound of wind, stream, sea, or songbirds. All musical cassettes used in the intervention consisted of soothing music with slow steady rhythm and low frequency tones.

Anxiety: Anxiety is defined as emotional reactions of a person who perceives a specific situation as threatening or dangerous at the moment (Spielberger, et al., 1983: 1), which are shown by “subjective feeling of tension, apprehension, nervousness, and worry, and by activation or arousal of the autonomic nervous system” (Spielberger, et al., 1983: 1). Anxiety is measured by the Numeric Rating Scale (NRS) of anxiety whose scores range from 0 to 10.

Physiological responses: Physiological responses are defined as clinical parameters that monitor clinical conditions of the subjects in this study, including heart rate, respiratory rate, and blood pressure (systolic blood pressure, diastolic blood pressure, and mean arterial pressure-MAP).

- Heart rate and blood pressure were measured by a portable bedside

monitor of Nihon Kohden Model Series No. BSM 2301K, which was a noninvasive device that was fully automatic and could be preset for measurements at specific time intervals.

- Respiratory rate was measured by counting the chest movement in one minute.

Weaning from mechanical ventilation: Weaning from mechanical ventilation is defined as "the process of abruptly or gradually withdrawing ventilator support from patients whose underlying cause of respiratory failure has either improved or been resolved" (Mador, 1998: 672). In this study, the weaning method included: (1) T-piece trial; (2) the external continuous positive airway pressure (CPAP); or (3) CPAP mode with pressure support of ventilator (PS < 10 cm H_2O in the patient who had an endotracheal tube and PS < 5 cm H_2O in the patient who had a tracheostomy tube).

Weaning parameters: The weaning parameters are "objective criteria used to predict the readiness of patients to successfully sustain spontaneous ventilation and maintain adequate oxygenation" (Manthous, et al., 1998: 886). In this study, weaning parameters refer to oxygen saturation, tidal volume, and rapid shallow breathing index (f/V_T).

- **Oxygen saturation:** Oxygen saturation is arterial oxygen saturation assessed by pulse oximetry (SpO_2), which is a noninvasive device frequently used in the critical care unit. In this study, oxygen saturation is measured by a portable bedside monitor of the Nihon Kohden Model Series No. BSM 2301K.

- **Tidal volume (V_T):** Tidal volume is the volume of air exhaled after normal resting inhalation (Thelan et al., 1998: 649), which is measured by Wright spirometer [Ferraris Series No. HS 28433 at the Medical Intensive Care unit (ICU), Ohmeda Series No. AAPW 60132 at the Intermediate Care Unit (7NW), and Ohmeda Series No. AAPW 60185 at the Coronary Care Unit (CCU)]. These spirometers were calibrated by the Inhalator Unit of Ramathibodi Hospital.

- **Rapid shallow breathing index (f/V_T):** Rapid shallow breathing index (f/V_T) is the ratio of respiratory frequency to tidal volume in liters. Currently, rapid shallow breathing index is used widely and accurately to predict the success of weaning from mechanical ventilation. In the literature review, it has been reported that

rapid shallow breathing index < 105 indicates high opportunity for successful weaning (Sumalee Kredboonsri, B.E. 2545: 319-320).

Significance of the Study

If the results of the study support the hypotheses formulated, music may be used as a complementary therapy to promote an independent role of nurses to help patients in the weaning phase to decrease anxiety and to increase relaxation. This may enhance successful weaning from mechanical ventilation, which, in turn, promotes health and well-being of the patients and reduces the staff's workload and health care cost.

Scope of the Study

The study was experimental research using a crossover design to test the effect of music therapy on the anxiety level, heart rate, blood pressure, respiratory rate, oxygen saturation, tidal volume, and rapid shallow breathing index in patients during weaning from mechanical ventilation in three settings: the Intermediate Care Unit (7NW), the Intensive Care Unit (ICU), and the Coronary Care Unit (CCU), at Ramathibodi Hospital, Bangkok, Thailand, from July 2002 to February 2003.

Summary

Weaning from mechanical ventilation can influence both physiological responses (e.g., increased respiratory rate) and psychological responses (e.g., anxiety) (Grossbach-Landis, 1980: 57). Based on the holistic approach, physiological and psychological changes are reciprocal (Dossey, 1992: 17). Music therapy is proposed to promote relaxation, which, in turn, reduces anxiety and sympathetic response (Watkins, 1997). Also, music therapy is feasible because it is a simple, non-invasive, and non-threatening method. Music therapy has been used in a variety of clinical settings for several purposes, but according to the literature review, it has never been used in patients during weaning from mechanical ventilation. The purpose of this study was to examine the effect of music therapy on anxiety, physiological responses, and weaning parameters in patients during weaning from mechanical ventilation. It was anticipated that if the results of the study supported the hypotheses, music therapy

may be applied to promote an independent role of nurses to help patients in the weaning phase to decrease their anxiety and enhance relaxation responses.

CHAPTER II
LITERATURE REVIEW

This chapter covers the literature related to nursing intervention for relaxation and relief of anxiety in patients during weaning from mechanical ventilation.

The literature review is divided into four sections as follows:

1. Weaning from mechanical ventilation
2. Impacts of anxiety on psychophysiological responses of patients during weaning from mechanical ventilation
3. Interventions to reduce anxiety
4. Music therapy

Weaning from Mechanical Ventilation

Weaning from mechanical ventilation can be defined as "the process of abruptly or gradually withdrawing ventilator support from patients whose underlying cause of respiratory failure has either improved or been resolved" (Mador, 1998: 672). Thus, weaning from mechanical ventilation is a step to increase patients' ability to breathe spontaneously. The physicians would assess daily readiness to wean of patients who have been relying on the ventilator because long-term mechanical ventilation may increase the risk of complications including disused atrophy, sepsis, pneumothorax, and poor mental health (Sumalee Kredboonsri, B.E. 2545: 313-314). The Third National Study Group on Weaning from Mechanical Ventilation by Knebel et al., (1994) described a conceptual weaning model, which was divided into three phases: preweaning, weaning process, and weaning outcome (Thelan et al., 1998: 682-686). Thus, weaning may be viewed as a continuum of three phases (Burns, 2001: 196).

Preweaning Phase

During the preweaning phase, decision making of weaning readiness is made when the patients' conditions have improved. The capacity to be weaned is assessed by several factors, including the patients' physiological and psychological conditions

(Armstrong, 1995: 53-56; Blackwood, 2000: 146-147; Burns, 1999: 465-479; Knebel, 1991: 322-325; Wilson, 1996: 692-693). Physiologic readiness as clinical factor assessment implies that the precipitating factor of a mechanical ventilator use has been resolved or improved, and the clinical status is stable. Particularly, respiratory assessment is a part of physiology assessment performed to evaluate pulmonary exchange and pulmonary mechanics. Psychological readiness is related to the feelings and emotions of patients, and is also used as an important factor to assess readiness for weaning (Knebel, 1991: 322). This assessment is useful to prevent the factors that can interfere with weaning. Thus, weaning criteria are determined by physiological and psychological assessment for readiness (see Table 1).

Table1. Physiological and Psychological Criteria for Determining Patients' Readiness for Weaning

- Resolution/improvement of the patients' underlying problem
- Normal state of consciousness/no seizure
- Adequate sleep
- Free from factors that increase or decrease metabolic rate (sepsis, bacteremia, hypo/hyperthyroid)
- Spontaneous respiratory rate < 25/min, without dyspnea and absence of accessory use
- Hemodynamic stable (heart rate < 120 beats/min, systolic blood pressure > 90 mmHg, or < 180 mmHg), no angina, no arrythmia, and no need to use vasopressor drug
- Adequate hemoglobin level (> 8-10 gm/dl), hematocrit > 25 % or baseline
- Receiving adequate nutrition as evidenced by increasing albumin or normal prealbumin and avoiding excessive feeding
- Absence of severe acid-base and electrolytes imbalance with normal limits of Ca^{++}, Mg^{+}, and $P0_4^{+}$
- Systemically hydrated such as weight at near baseline, balanced intake and output

Table1. Physiological and Psychological Criteria for Determining Patients' Readiness for Weaning (continued)

- Absence of bowel problems
- Improved general body strength/endurance
- Improved chest x-ray
- Adequate pain control
- Being orientated
- Mental ease
- Positive attitude

(Blackwood, 2000: 146-150; Burns, 1999: 473; Knebel, 1991: 322; Sumalee Kredboonsri, B.E. 2545: 314-315).

These factors may affect the patients' ability to wean from mechanical ventilation. The consciousness of patients can protect the airway by coughing and producing adequate minute ventilation. Inadequate sleep, especially deficiency of non REM, leads to fatigue and weakness, which, in turn, affect self-care ability, as well as thinking and decision making of the patients (Orasa Panpakdee, B.E. 2536: 218). Cardiac output affects heart rate and blood pressure. During the rest period, metabolic requirements are low, and cardiac output may only be two to three Litres per minute. When metabolic requirements are increased due to factors such as fever, activity, infection or hyperthyroid, cardiac output will increase by increasing heart rate, which is performed to meet metabolic demands of the body (Morelli, 1999: 115). Thus, they should be improved until the hemodynamic is stable before weaning.

Hemodynamic is an indicator of the cardiovascular function. The optimal cardiac output induces adequate transport of oxygen to tissue. The content of oxygen is related to the hemoglobin level because the combination of oxygen and hemoglobin is called oxyhemoglobin. The amount of oxygen carried is shown by the saturation of hemoglobin with oxygen (SaO_2). If the hemoglobin level or hematocrit is low due to causes such as anemia, the content of oxygen is reduced (Brooks-Brunn, 1999: 365). Therefore, adequate hematocrit and hemoglobin are important for oxygen delivery.

In addition, the patients' nutrition status must be adequate for the energy needs of healing, increased respiratory muscle demands, and increased mobility. Monitoring albumin level is performed to detect nutrition imbalance. Excessive feeding will increase CO_2 production and ventilatory workload. Fluid and electrolyte are also important because they have an impact on the weaning process. Electrolytes such as potassium, magnesium, and calcium may involve muscle contraction (Sakallaris, 1999: 434-440).

Given that psychological readiness is an important factor in weaning process, orientation and being informed of the weaning process help the patient to have mental ease. The patients can make sense and understand the situation, and then, they will be able to control negative responses such as anxiety. Having a positive attitude is the ability to preserve a sense of self and the ability to endure and maintain hope in the weaning situation. Therefore, nurses may help patients by offering emotional support, motivation, and co-operation in the weaning process (Blackwood, 2000: 149).

Respiratory assessment of weaning parameters is evaluated by the capacity of pulmonary gas exchange and pulmonary mechanic. Weaning parameters are used to predict the readiness of patients to successfully manage the spontaneous breathing to maintain adequate ventilation, oxygenation, strength, and endurance of the respiratory system. A variety of respiratory assessments are available to assess the patients' ability to wean from mechanical ventilation. The commonly used parameters for weaning are shown in Table 2.

Table 2. Respiratory Assessments for Weaning

Respiratory Parameter	Normal Value	Weaning Criteria
Volumes		
Tidal volume (V_T)	350-600 ml	> 5 ml/kg
Minute ventilation (V_E)	4-8 L/min	5-10 L/min
Vital capacity (VC)	60-80 ml/kg	>10-15 ml/kg, or ≥ 1 L

Table 2. Respiratory Assessments for Weaning (continued)

Respiratory Parameter	Normal Value	Weaning Criteria
Airway Pressure		
Peak inspiratory pressure (PIP)	Individual trend	
Static pressure	Individual trend	> 30-33 ml/cmH_2O
Oxygenation and Ventilation		
Oxygen saturation		> 90 %
PaO_2 on FiO_2 0.4		> 60 mmHg
$PaCO_2$	35-45 mmHg	< 60 mmHg
Respiratory Mechanic		
Respiratory rate	20 beats/min	≤ 35 beats/min
Negative inspiratory force or pressure (NIF, NIP)	- 80 to -100 cmH_2O	- 30 cmH_2O
Maximum voluntary ventilation (MVV)	120-180 L/min	> twice V_E
Rapid-shallow breathing index (f /V_T ratio)	Threshold is 100 breaths/min/L	< 100 breaths/min/L
Work of breathing index (WOB)	> 1.8 kg.m/min	≤ 1.5 kg.m/min
Oxygen cost of breathing (OCB)	Threshold is 15 %	15 %
CROP Score (combining measure of compliance, rate, oxygenation, and maximum inspiration pressure)	≥ 18	≥ 18

(Armstrong, 1995: 53-54; Bridges, 1992: 15-19; Burns, 1999: 473; Chao & Scheinhorn, 1998: 802-804; Esteban & Alia, 1998: 999-1000; Knebel, 1991: 324; Manthous, et al., 1998: 887-898; Sakallaris, 1999: 421; Sumalee Kredboonsri, B.E. 2545: 315).

Only one weaning parameter could not accurately predict the weaning progress. Thus, a combination of the clinical factors and respiratory assessments may more

accurately predict weaning readiness among the patients weaning from mechanical ventilation. Psychological readiness for weaning is an important factor that has an impact on the patients' perception and physiological responses because there is a reciprocal and complex relationship between the mind and the body. Psychological distress such as anxiety and fear may precipitate physiological distress by stimulating the sympathetic nervous system. As a result of actions on the sympathetic nervous system, physiological responses will occur including increases of cardiac output, respiratory rate, muscle tension, and bronchoconstriction, resulting in change of weaning parameters and vital signs. Then, failure to wean may be present (Blackwood, 2000: 147; Grossbach-Landis, 1980: 57-58).

While work of breathing during weaning is increased, the experience of dyspnea can be seen (Bouley, et al., 1992: 471-476). This could induce psychological distress such as anxiety as well. Therefore, the role of nurses is to help the patients relieve their anxiety before the weaning process begins, including providing information of the weaning process for patients to make decision toward the weaning plan, giving an orientation, offering mental support, and fostering a positive attitude toward weaning (Blackwood, 2000: 149; Logan & Jenney, 1997: 140-147).

Difficulty in communication of intubated patients can be related to the patients' inability to verbalize, and this can be a major factor that induces the negative emotions such as anger, fear, or anxiety (Menzel, 1998: 245-252). Particularly, dyspnea will be present during the weaning period. Thus, an establishment of the effective communication; for example, using eye signals, lip reading, palm writing, pen and paper, alphabet board, flash cards, and deflating tracheostomy cuff may reduce the patients' frustration (Wilson, 1996: 693).

Weaning Process

Weaning procedures are usually practiced only after the underlying disease for mechanical ventilation has improved or resolved. The patients should have adequate gas exchange, stable vital signs and hemodynamics, as well as desired neurological and muscular status before weaning. Multiple methods of weaning from mechanical ventilation are chosen depending on schools of thought (Blackwood, 2000: 146-147), underlying conditions of respiratory disorder, physiological and psychological response to the weaning process, and skill of clinical physicians. The appropriate

outcome of weaning from mechanical ventilation are maintaining respiratory muscle function, avoiding inspiratory muscle fatigue, and maintaining adequate oxygenation (Bouley, et al., 1992: 471). From a systematic review of the literature, there are more than one effective methods of weaning (Butler, et al., 1999: 2331-2336).

Currently, the main methods of weaning from mechanical ventilation include spontaneous breathing with T-piece, external continuous positive airway pressure (CPAP), CPAP mode of ventilator, synchronized intermittent mandatory ventilation (SIMV), and pressure support ventilation (PSV) (Blackwood, 2000: 146-147; Butler, et al., 1999: 2331-2336; Chao & Scheinhorn, 1998: 805-810; Esteban & Alia, 1998: 1000-1003; Wilson, 1996: 693-695). Each of these techniques can be used alone or in a combination with one another. The techniques for weaning include abrupt trials or decreasing gradual support.

T-piece weaning is used frequently in some critical care units. It represents the method with no additionally imposed work of breathing in that neither ventilator valves nor circuits are involved. Because there is no demand valve to open with the low resistance system, it can be used to minimize the breathing effort. The T-piece weaning method can be practiced into two ways including single T-piece trial and intermittent T-piece trial. The amount of time of patients' breath with the T-piece depends on the patients' ability to tolerate spontaneous breathing. This T-piece method has positive aspects to test the patients' ability of spontaneous breathing. Theoretically, it can build the muscle strength because it provides the period of work and rest (Esteban & Alia, 1998: 1001; Knebel, 1991: 326). However, this method may induce an excessive workload of breathing, which can result in muscle fatigue including paradoxical breathing, respiratory alteration, and eventually failure of the trial. Therefore, vital signs and pulmonary mechanics are recorded at least every one hour and termination of weaning has to be done when these parameters alter in a poor way (Sumalee Kredboonsri, B.E. 2545: 324).

CPAP (continuous positive airway pressure) is a method to apply continuous positive pressure to the airway during spontaneous breathing trials. CPAP may be used to increase functional residual capacity that can decrease the tendency for airway collapse and atelectasis, and to improve gas exchange and lung volume. However, when the pressure drops, the patients require an initiation of breathing to open the

valve system of CPAP. This process will increase the work of breathing and may interfere with weaning (Knebel, 1991: 329; Tosaporn Kumponsiri, B.E., 2537: 27). This CPAP weaning method is appropriate in some cases such as the patients who wean successfully with the weaning method of pressure support ventilation or intermittent mandatory ventilation, but they cannot spontaneously breathe in the T-piece trial. Therefore, the CPAP method helps them to train their respiratory muscle before using the method of T-piece trial. The usefulness of CPAP is its use with some patients including those with muscle weakness, diaphragmatic paralysis, or severe resistive load including COPD (Sumalee Kredboonsri, B.E. 2545: 331-332). Initially, the period of T-piece trial or CPAP is short intervals, and then the length of each period of weaning is increased following increased respiratory muscle strength and endurance to maintain spontaneous respiration (Wilson, 1996: 694).

SIMV (synchronized intermittent mandatory ventilation) reflects a more gradual approach to withdrawal, which involves a gradual reduction in the amount of the patients' respiratory work. It delivers a preset number of volume-controlled breaths per minute, whilst allowing the patient to take spontaneous breaths in between machine breaths. Therefore, it may be used for patients with congestive heart failure who cannot tolerate sudden increases in venous return. This method has a potential for patients who are afraid that they will not be able to breathe without the help of the ventilator. However, extra work is required for the patients to trigger the demand value for spontaneous breath through the ventilator circuit. It may cause more increase in work of breathing and oxygen consumption (Blackwood, 2000: 147; Esteban & Alia, 1998: 1002; Knebel, 1991: 326).

PSV (pressure support ventilation) is used to counteract the work of breathing. It is imposed by the endotracheal tube and the ventilatory circuit by augmenting a spontaneous breath with a fixed amount of positive pressure. The patients have control over the respiratory rate, inspiratory time, and flow rate. The level of pressure support is decreased gradually, depending on the patients' ability to maintain an adequate tidal volume. Therefore, it is useful for the patients who have dyspnea with a ventilator because they can control the breathing cycle (Blackwood, 2000: 147; Esteban & Alia, 1998: 1002; Knebel, 1991: 328).

Before starting the weaning trial, the patients' airway should be clear and seated upright to optimize the diaphragmatic position. When the patients reach the psychophysiologic readiness, the weaning process will be started. During the weaning period, the nurse would closely observe clinical conditions, monitor physical parameters including respiratory rate, heart rate, blood pressure, and monitor weaning parameters of pulmonary function. The combination of clinical factor assessment and several weaning parameters assessment may give a better picture of the patients' condition during weaning from mechanical ventilation because those parameters can reflect perfusion, oxygenation, ventilation, strength, and endurance of the respiratory system.

Once the weaning process has begun, the patients are continuously assessed for signs of intolerance as shown in Table 3. If these signs are present, the previous ventilator method should be used.

Table 3. Weaning Intolerance Indicator

-Respiratory rate increases to 30 breaths/minute (sustained)
-Oxygen saturation falls to < 91% or 2% below baseline (sustained)
-Heart rate increases by 20% (sustained) such as increase more than 20 beats/minute
-Systolic blood pressure > 180 mmHg, or <90 mmHg
-Tidal volume decreases < 200 cc.
-Minute ventilation decreases < 5 liters or increases > 12 liters
-Rapid shallow breathing index (RSBI) > 105
-ABGs with respiratory acidosis (pH 7.31)
-Excessive anxiety or agitation
-Diaphoresis
-Change of mental status
-Excessive dyspnea

(Burns, 1999: 475-476; Burns, 2001: 198; Sumalee Kredboonsri, B.E. 2545: 333).

Weaning Outcome Phase

The weaning outcome phase is the final process of weaning. The physician may make decision regarding extubation at anytime or continuous weaning process depending on the outcome of clinical factors and respiratory assessment. However, when the patients are able to breathe spontaneously for 24 hours without assistance of mechanical ventilator or dyspnea with acceptable arterial blood gas, as well as with stable hemodynamic and unchanged neurological signs, the patients may be extubated at anytime (Knebel, 1991: 329-330). Then, the nurse can help patients to maintain adequate gas exchange and to promote recovery. Some patients whose weaning is unsuccessful may require the long-term mechanical ventilator support. Thus, a care plan for long-term mechanical ventilator would be coordinately performed by the patients, family, and healthcare providers.

Impact of Anxiety on Psychophysiological Responses of Patients During Weaning from Mechanical Ventilation

According to the concept of the mind-body connection, physiological and psychological aspects are interrelated (Dossey, 1992: 17). Therefore, the patients' emotion related to their illness will be inextricably linked with their physical condition. The critical patients may be anxious due to severe illness, the use of mechanical ventilation for life support, and the critical environment. These factors may induce stress among these patients. Some of the negative effects include dyspnea (Connelly, et al., 2000: 173-179), mood disturbance (Connelly, et al., 2000: 173-179; Higgins, 1998: 177-183), distress caused by the difficult communication, pain, limitation of physical movement, discomfort (Supatra Yusook et al., BE. 2536: 34-46), anger, worry, and fear caused by the inability to speak (Menzel, 1997: 363-371; Menzel, 1998: 245-252).

During a weaning period, the transition from mechanical ventilation to spontaneous breathing, the patients must make effort of breathing to meet adequate energy demands. The experiences during weaning from mechanical ventilation on both physiological and psychological aspects such as the experience of fatigue (Higgins, 1998: 177-183; Logan & Jenney, 1997: 142-147), dyspnea (Bouley et al., 1992: 471-476; Logan & Jenney, 1997: 145), and negative emotions including

insecurity, fright or frustrated situations, fear of dying, depression, and anxiety (Logan & Jenney, 1997: 142-147) may occur.

Thus, the process of weaning from mechanical ventilation may be affected by psychological factors. Patients' anxiety may increase because of increased shortness of breath and a fear of death (MacIntyre, 1995: 278). The shortness of breath may induce anxiety as well (Grossbach-Landis, 1980: 57-58) (see Figure 2).

Weaning from mechanical ventilation is the part of factors that produce additional anxiety because the patients must make effort to reload the respiratory pump (Chao & Scheinhorn, 1998: 804). When psychological distress such as anxiety is present, the physiological distress occurs because the sympathetic nervous system is stimulated (Grossbach-Landis, 1980: 57-58). Accordingly, bronchoconstriction and tightening of chest muscles may occur and result in increasing airway resistance, breathing effort, and energy requirement. Shortness of breathing will occur when the body systems compensate inadequately, which, in turn, induces anxiety (Blackwood, 2000: 147; Grossbach-Landis, 1980: 57-58). Because there is an intimate and complex interconnection between the mind and the body in the holistic model, physiological and emotional changes are reciprocal (Dossey, 1992: 17).

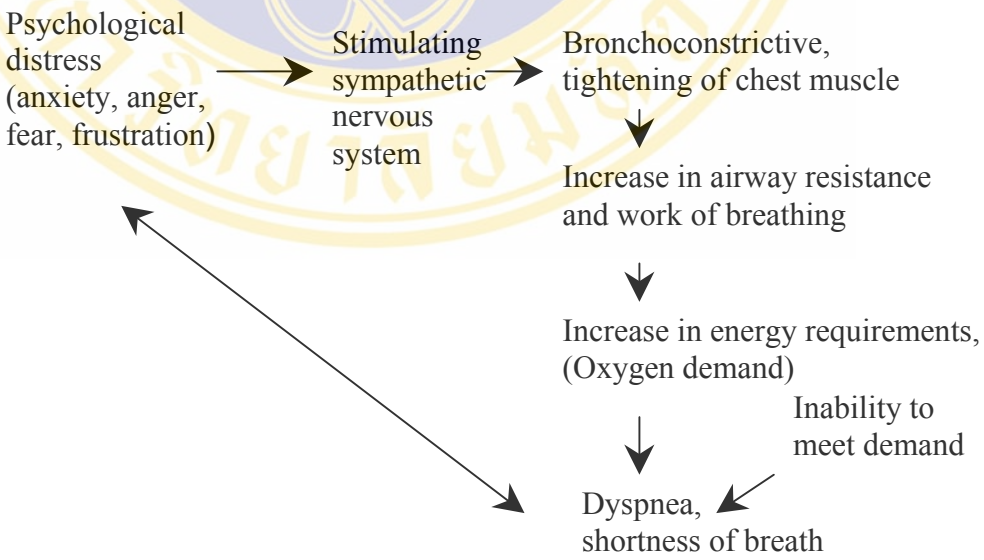

Figure 2. Impact of Anxiety on Psychophysiological Responses of Patients during Weaning from Mechanical Ventilation

(Modified from Blackwood, 2000: 147; Grossbach-Landis, 1980: 57-58).

Interventions to Reduce Anxiety

Anxiety is the complex experience for critically-ill patients because they must interact with the acute illness within the multifaceted and complicated environment that can evoke negative emotion (Dossey, 1992: 27). Nurses play a significant role to promote healing because they are concerned with health and illness of clients. Thus, they have the opportunity to help patients in the challenging life crisis and transitions (Wells-Federman, et al., 1995: 59).

Cognitive therapies are in a category of self–regulation strategies that can induce positive psychophysiological responses by establishing a sense of control and balance in one's emotional status, which, in turn, directly affects the physiologic status (Dossey, 1992: 27). Cognitive therapy is defined as "a therapeutic approach that addresses the relationships among thoughts, feelings, behaviors, and physiology" (Stuart-Shor & Wells-Federman, 2000: 377-378). Therefore, cognitive therapies will be used as complementary therapy to relieve anxiety. From the literature review, cognitive therapies include music therapy, relaxation techniques, imagery, and biofeedback.

The mechanism of cognitive therapies is based on the premise that stress is caused by perception, or the way people think. When people perceive stress, which is negative thoughts, such perception can lead to changes in physical, emotional, behavioral, and spiritual states. They can restructure these negative thoughts for health promotion, symptom reduction, and disease management by the link of influence of the limbic–hypothalamic system, which is the major anatomic connection linking between the mind and the body (Stuart-Shor & Wells-Federman, 2000: 377-378). This technique uses the mind modulation including thoughts, feelings, attitudes, and emotions by transformation in the brain to neurohormonal messenger molecules. Then, they send them to all body systems, and in this process changes in the autonomic, endocrine, immune, and neuropeptide systems can be induced (Dossey, 1992: 17) and that physiologic changes also influence thoughts and feelings. Understanding this psychophysiologic connection provides the rationale for caring the person as a whole: mind, body, and spirit. Therefore, nurse are enabled to use the cognitive therapies to coach patients to promote the relaxation responses and decrease anxiety (Wells-Federman et al., 1995: 62).

Cognitive therapies, as holistic self-regulation therapies, have been used to decrease negative outcomes, particularly anxiety and other outcome variables in different populations such as reducing anxiety in clients undergoing magnetic resonance imaging (Thompson & Coppens, 1994: 59-69), reducing pain and anxiety and improving quality of sleep in the perioperative management of proctological patients (Renzi et al., 2000: 313-316), reducing anxiety and surgical wound erythema in patients undergoing cholecystectomy (Holden-Lund, 1988: 235-244), and reducing anxiety and vomiting in patients receiving chemotherapy (Arakawa, 1997: 342-349; Frank, 1985: 47-52).

In a critical care setting in particular, there has been limited use of cognitive therapy in weaning from mechanical ventilation. Some interventions based on cognitive therapies are shown.

Biofeedback is one of the relaxation interventions in patients weaning from ventilation. Holliday and Hyers (1990) studied the use of tidal volume and relaxation biofeedback to reduce the time of weaning from mechanical ventilation. After the patients had received ventilator for seven days and beginning to wean, they were assigned to the biofeedback group and the control group. The biofeedback group received daily electromyographic (EMG) relaxation feedback for anxiety reduction, improved respiratory muscle EMG efficiency, tidal volume/diaphragm EMG (V_T /DAP), and V_T feedback for increasing V_T and respiratory drive (tidal volume/ inspiratory time) until extubation. On the other hand, the control group was visited daily to control for attention and reassurance. The result showed that the patients in the biofeedback group had a significant increase in respiratory drive such as tidal volume than the control group.

Corson et al. (1979) used biofeedback to wean two cases of paralyzed patients who were dependent on mechanical ventilation by altering breathing patterns to reduce respiratory rate and increase tidal volume. During each session, the patients were trained to maintain respiratory rates and tidal volumes to the next session. Finally, two patients were successful in weaning from ventilator after biofeedback intervention, and they demonstrated ability to maintain the spontaneous breathing and improve tidal volume as well as vital capacity.

Similarly, LaRiccia et al. (1985) used a combination of visual biofeedback and hypnosis to wean a woman patient with multiple sclerosis from mechanical ventilator who had failed in previous weaning attempts by standard procedures. The patient was given eight sessions of training over 12 days. Each session lasted 50 to 90 minutes. Movement of chest wall was monitored by an oscilloscope and the patient was shown a drawing of an appearance of the desired respiratory wave form. During biofeedback sessions, the patient was praised for increasing amplitude of chest wall movement and decreasing her respiratory rate. After the eighth session, the patient was considered successful in weaning from a ventilator, and the note showed that the patient's anxiety level was greatly improved after the first training session.

Treggiari-Venzi et al. (2000) used hypnosis as an adjunctive therapy in patients with complications difficult to wean. Although clinical conditions and lung mechanics were stable over the ventilator weaning period, the patients were unable to tolerate weaning for than more 12 hours. Therefore, they received hypnotic psychotherapy from the authors for five sessions. The technique focused its attention on goal-directed imaging and self-reinforcement including a behavioral aspect directed toward relearning to breathe at a lower frequency and with a cognitive aspect. At the end of the session, the patients' anxiety decreased, but their spontaneous ventilation, pleasant feeling, and comfort increased.

In the literature, although the aforementioned techniques are effective to increase positive outcomes of weaning from mechanical ventilation, they are difficult for the patients in the critical care unit to focus attention in the moment without anticipating the future or thinking of the past (Wells-Federman et al., 1995: 63). The process of these techniques requires skills, intention, and communication as well. Cognitive coping is not easy because the patients must be the active participants. In fact, basically, the patients in the critical care unit tend to have fatigue and low energy. Therefore, music therapy is an appropriate choice for use during weaning because music does not require much concentration and it is practical for patients to use. In addition, people tend to accept music that they like as a part of their lives and it is more likely to perceive as a pleasant thing (Chlan & Tracy, 1999: 36).

Music Therapy

Music therapy is a "behavioral science concerned with the systematic application of music to produce relaxation and desired changes in emotions, behavior, and physiology" (Guzzetta, 1995: 670). Music is closely related to experience of being human. In the former times, people knew and were interested in the effects of music on themselves and others (Alvin, 1966: 73). The ancient men of medicine learned using the effect of music on healing the mind and the body (Cook, 1981: 252). According to Greek mythology, people believed that the power of music could help the healing of the body and soul (Guzzetta, 1995: 670). Florence Nightingale, a nursing pioneering leader, recognized the power of music to promote healing. She noted, "The effects of different types of music, recommending wind instrumental pieces with continuous sound or an air as generally having a beneficent effect for the sick"(cited in Snyder & Chlan, 1999: 4-5). Therefore, it is not surprising that the power of music is applied as a part of complementary therapies to aid healing.

Music therapy has been used in many clinical settings. Most studies have documented the effects of music therapy such as on relaxation in patients with mechanical ventilation (Chlan, 1998; Puang-Ngern, 2001; Wong et. al, 2001), reducing anxiety of patients in a critical care unit (Lueders-Bolwerk, 1990; Chlan, 1998; Davis-Rollans & Cunningham,1987; Guzzetta, 1989; Puang-Ngern, 2001; Wong et al, 2001), reducing anxiety in patients in the surgical settings (Augustin & Hains, 1996; Kaempf & Amodei, 1989), and decreasing pain level and frequency of pain medication administered in patients with the post operative urological operation (Bamphenchit Sangchart, B.E. 2528). For specific populations such as patients who received high-dose chemotherapy, music was used as an adjunct to antiemetic therapy (Ezzone et al., 1998). Also, in patients with COPD living at home, music was used as an intervention to decrease dyspnea and anxiety (McBride et al., 1999). Additionally, music therapy was found to be useful in palliative care. Patients and families revealed positive verbal responses and displayed relaxed or changed effects (Gallagher et al., 2001).

Attributes of Music Therapy

Music is "a variety of sounds brought together in specific structure, organizations, and relationships" (Barber, 1999: 443). The essential element of music

consists of, for example, rhythm, melody, pitch, and harmony. The organization of sounds and time of music can induce the audience to think of the meaning (Simms, 1993: 15). The various types of vibrations of music have different influences on psychophysiological mechanisms. Therefore, music may be used as a therapeutic intervention. Rhythm is the "music's organizing principle, and beats are the regular divisions of time which define rhythm" (Politoske, 1992: 21). It is one of the most essential structural and organizational elements of music when using music therapeutically because the rhythm as the pattern of the movement of music may be a major cause of one's physiological response to music. For example, beats of 70 to 80 per minute (approximate to the human heartbeat) are soothing, while faster beats can increase tension (Cook, 1981: 259; Thaut et al, 1999: 107). Thus, rhythm would be a key consideration in choosing music collection for specific purposes (White, 2000: 220). Melody consists of the tune in a piece of music, concerned with human emotions such as the sense of highness and lowness which depend on the perception of melodic shape and motion (Politoske, 1992: 27). On the other hand, pitch is "the number of vibrations that occur per second in musical tone." The musical tones are regarded in terms of upward or downward movement of pitch. Those tones influence feeling (Politoske, 1992: 27). Pitch acts on the autonomic nervous system, with high pitch causing tension, while low pitch causing relaxation. Therefore, the melody has impact on the listener's emotional or physiologic response to music such as decreased anxiety and physiological relaxation (Cook, 1981: 258; White, 2000: 220). Harmony is "a more complex phenomenon which involves the sounding together of two or more tones with the effect of adding musical depth and richness" (Politoske, 1992: 33).

However, most studies regarding the music therapy in the field of nursing and medicine have used music as an anxiolytic (anxiety reduction) intervention. Generally, it is demonstrated that the relaxing or soothing music can effectively reduce anxiety and promote relaxation in the music therapy study. Its characteristics include soothing (White, 1992: 60), non-lyric-containing music with 60 to 80 beats per minute (Chlan, 1998), soft repetitive music (Lueders-Bolwerk, 1990: 69), minimum rhythmic activity, and no percussive instruments (e.g., drums, xylophone) (Kaempf & Amodei, 1989: 115). Music selection without words is preferable because the listener could concentrate on the flow of music so that they do not think about words, messages, and

meaning of the music (Guzzetta, 1995: 679). The melodic nature of sounds such as birds' songs, or whales or dolphins' songs can also induce relaxation (Barber, 1999: 444). In addition, the advantage of the natural sound minimizes the variation of individual factors such as personal preference, culture, tradition, and language (Cook, 1981: 261). In Puang-Ngern's study (2001), the natural sounds, which consisted of the sound of wind, stream, sea, and songbirds were used. It was found that the anxiety level and physiological responses such as heart rate, respiratory rate, and systolic blood pressure of patients with the mechanical ventilation were decreased significantly during the music period of therapy period. Therefore, individual music preference is an important factor that would determine because each individual will react differently to the same music, and each of them might respond differently to different types of music (Cook, 1981: 258).

Effect of Music Therapy on Psychophysiological Responses

Music is a unique stimulus that affects psychophysiological responses of the listener (Chlan & Tracy, 1999: 35). The nonverbal nature of music affects the right hemisphere of the brain whose function is implicated in intuitive, creative, and imaginative way of processing information. Music therapy can induce psychophysiological responses through the influence of musical pitch and rhythm on the limbic system which is concerned with emotions, feelings and sensations; thus, emotional reactions to music can occur (Guzzetta, 1995: 674-676). An alteration of a person's psychophysiological responses is the goal of music therapy. In particular, the type of soothing music can induce a hypometabolic response resulting in body relaxation signified by changes of autonomic, immune, endocrine, neuropeptide, cardiovascular, and respiratory systems (Guzzetta, 1989; Guzzetta, 1995: 674). Likewise, music therapy can be used for desired psychological responses such as decreased anxiety and fear (Guzzetta, 1995: 674). These results reflect body connection (Dossey, 1992: 17).

When persons perceive a situation as a threat of their physical or emotional well-being, the ability to cope may be compromised. When stress occurs, the central nervous system is stimulated, which, in turn, activates the sympathetic nervous system (Wells-Federman et al., 1995: 60), resulting in increased norepinephrine and

epinephrine neurotransmitters. These hormones can induce a generalized arousal of the body including increases of heart rate, blood pressure, respiratory rate, muscle tension, and metabolic rate. Furthermore, the stress response may cause or exacerbate symptoms such as anxiety (Wells-Federman et al., 1995: 60-61).

Music therapy can promote the relaxation responses by breaking the stress symptom cycle. It is believed that the effect of music is that it can pass through the medial geniculate nucleus of the thalamus (Barber, 1999: 444) to auditory cortex by integrating function of limbic-hypothalamic system that leads to a generalized decrease in central nervous system arousal. This, in turn, decreases sympathetic nervous system activity of autonomic nervous system by decreasing secretion of epinephrine and norepinephrine hormones of adrenal medulla, resulting in lower heart rate, blood pressure, respiratory rate, muscle tension, and metabolic rate (Benson, 1975: 52-53; Wells-Federman et al., 1995: 60-61).

The limbic portion of the central nervous system involves thoughts, feelings, and emotions, whereas the hypothalamic portion of the limbic systems regulates homeostasis and provides continuous feedback between the mind and body (Wells-Federman et al., 1995: 60). The neurotransmitters in the sensory-neural pathways, which carry the neuronal coding of the music sound and pass through the limbic system, have impact on mental and emotional aspects, resulting in relaxation responses and reduced anxiety (Barber, 1999: 445).

In conclusion, the sensory neural pathway functions pass through thalamus. The effect of music which promotes calmness and relaxation can produce desired changes of autonomic, immunologic, endocrine, and neuropeptide systems. The immediate influence of music therapy affects the mind state, which, in turn, influences the body state. Thus, music therapy is believed to affect psychophysiologial responses that induce a balance of mind-body-spirit (Guzzeta, 1995: 676).

Effectiveness of Music Therapy in the Clinical Care Settings

Music therapy has been tested in several clinical settings for the purpose of anxiety reduction and relaxation promotion. Various clinical outcomes have been used to measure the effectiveness of music therapy as a nursing intervention such as psychological and physiological outcome variables.

The Effect of Music Therapy on Anxiety in the Clinical Care Settings

Music therapy can induce psychological responses through the influence of musical pitch and rhythm on the limbic system. Soothing music can be used for desired psychological responses such as decreasing anxiety. Most studies used changes of the anxiety level to measure psychological responses as an outcome variable. A large number of studies selected the anxiety measurement tools such as the State-Trait Anxiety of Spielberger (Marteau & Bekker, 1992; Spielberger et al., 1983), numeric scale, visual analogue scale, and self-report of anxiety. However, from a literature review, not all of those studies were successful in using music as an intervention to decrease anxiety.

In a critical care unit, Wong et al. (2001) examined the effects of relaxing music on state anxiety scores in 20 ventilator-dependent patients. The crossover repeated-measures design with random assignment was used. The subjects were exposed to both conditions: music and rest period. In the music condition, the subjects received a 30-minute relaxing music session, while in the control condition, the subjects received a 30-minute uninterrupted rest, with an interval between the two of at least six hours within one day. Anxiety was measured by the short version (six items) of the State-Trait Anxiety Inventory (STAI) of Spielberger, the Chinese version, at pretest and posttest conditions. Because of the crossover design, the subjects acted as their own control, and demographic characteristics were equivalent. There were no statistically significant differences in the baseline data of state and trait anxiety by paired-samples t-test. However, the paired t-test revealed a significant difference between groups on the post-test mean of the state anxiety scores. The subjects who received a 30-minute relaxing music session had lower state anxiety scores than those who received a 30-minute uninterrupted rest period.

Likewise, Puang-Ngern (2001) tested the effectiveness of music therapy on anxiety, physiological response, oxygen saturation, and vital capacity in mechanically ventilated patients. A change over design was used in this study in which the subjects were used as their own control. The sequence of the application of music or control period was randomized among 30 mechanically ventilated patients. In the experimental period, the subjects listened to the music, which they chose from the natural music collection, via headphones for 30 minutes. In the control period, the

subjects did not receive the music therapy, but they rested and took the headphones to prevent them from surrounding noises for 30 minutes. The anxiety level was measured by a numeric scale (NRS, from 0-10). Using the paired t-test, the results of the study showed that during the 30-minute music therapy period, the anxiety level of the subjects was significantly decreased more than that in the control period.

Similarly, Chlan (1998) tested the effects of music therapy on relaxation and anxiety reduction in patients with mechanical ventilation. A two-group, pretest-posttest experimental design with repeated measures was used. Fifty-four patients who received a mechanical ventilator were randomly assigned into two groups: receiving either a 30-minute music condition via headphones or a rest period. The state anxiety was measured by the short version (six items) of the State-Trait Anxiety Inventory (STAI) of Spielberger. Independent t-test was used to test for equivalence of the baseline means. The state anxiety levels at the baseline of the two groups were equivalent. Results of this study showed that the subjects of the music therapy group had significantly lower state anxiety at posttest than those of the control group. Moreover, the investigator supported using music therapy as an effective nursing intervention to decrease anxiety in ventilator-dependent patients.

Moreover, White (1992) examined the effects of relaxing music on decreased state anxiety in patients with a confirmed medical diagnosis of acute myocardial infarction. Forty patients with myocardial infarction with elevated state anxiety levels (scores $\geq$ 40) were randomly assigned into two equal groups. The intervention in the experimental group included listening to 25 minutes of investigator-selected classical music via headphones. In the control group, the patients received a 25-minute rest period without music. The State-Trait Anxiety Inventory (STAI) of Spielberger was used to measure anxiety. The baseline anxiety levels of the two groups were homogeneous by using two-by-two analysis of covariance. The results showed that the state anxiety scores were significantly reduced in both groups at post treatment by paired t-test, but the degree of state anxiety reduction was significantly greater in the music group by using multiple analysis of covariance. Moreover, the subjects commented on the usefulness of music, which better induced relaxation than rest.

As for some studies in the critical care unit (CCU), Lueders-Bolwork (1990) tested the effects of relaxing music on state anxiety of adult patients after myocardial

infarction. Thirty-five patients after myocardial infarction with elevated state anxiety levels (scores ≥ 40) were randomly distributed into two groups: either non-music or music groups. Both groups' anxiety levels were measured by the STAI with reliability coefficients for state and trait anxiety of .83 to .92 at pre-treatment. Approximately, 22-minute relaxing music session was provided by the investigator in the music group on three consecutive days. It was found that the state anxiety decreased in both the music and control groups, but in the music group, anxiety significantly reduced more at post-test than that in the control group.

Music therapy was effective in the reduction of post-operative state anxiety in the patients with abdominal operation and mechanical ventilation (Pensri Suharitdumrong, B.E. 2537). Thirty-six postoperative patients with mechanical ventilation were randomly assigned into two groups. In the experimental group, the subjects listened to a 17-minute soothing Thai music session, twice a day, at six hours apart. In the control group, the subjects did not receive music therapy. The State Anxiety Inventory (Spielberger, 1970) was used to measure anxiety, and the independent t-test was used to compare the mean difference of the anxiety scores at pre-test between groups. The significant difference was not found, and the result of this study demonstrated that the subjects in the experimental group had significantly lower mean score of anxiety level than that of those in the control group. Additionally, most patients stated the usefulness of music therapy, such as relaxation, calmness, silence, and uplift from sadness or anxiety.

However, other studies in the CCU reported a non-significant change of the anxiety level. Zimmerman et al. (1988) investigated the effects of listening to a relaxation type of music on self-reported anxiety in patients with suspected myocardial infarction. Seventy-five patients were randomly assigned to one of the following three groups: an experimental group in which the subjects received 30 minutes of self-selected music, an experimental group in which the subjects received 30 minutes of white noise (listening to synthetic silence tape), and a control group in which the subjects laid quietly and uninterruptedly in bed for 30 minutes. The State-Trait Anxiety Inventory was administered at the pretest and posttest. No significant difference was found among groups on demographic characteristics. An analysis of covariance (ANCOVA) showed that there was no significant difference among the

groups on posttest state anxiety scores. Every group showed a trend toward decreased anxiety scores, particularly in the music group, in which anxiety scores had only a slightly greater decrease than that in the other groups.

The investigator explained the reason for the non-significant result that the majority of the subjects had low anxiety scores because most critical patients frequently showed denial in coping. In addition, the biased sample selection was another reason because the patients whose conditions were unstable and physiologically compromised were excluded. These patients tended to have a high anxiety level. Because the result in this study did not show the significance of music therapy on the anxiety level, the authors suggested that in future studies the sample size should be increased and the subjects should receive music therapy more than one time.

Elliott (1994) tested the effect of music and muscle relaxation technique compared with the control group in reducing the anxiety of patients with ischemic heart disease in the CCU. Fifty-six patients with unstable angina pectoris or acute myocardial infarction were randomly assigned into three groups. In the music group (n = 19), the subjects received the light classical music relaxing tape. In the muscle relaxation group (n = 18), the subjects received verbal instructions on tape for muscle relaxation. Both music and muscle relaxation sessions were administered for 30 minutes per session, for two or three times within a 24-hour period. The number of sessions were determined by demand and supply of CCU bed and the clinical condition of patients who participated in the intervention. In the control group (n = 19), the subjects received uninterrupted rest for 30 minutes twice a day. Anxiety was measured by psychological instruments as follows: the State Trait Anxiety Inventory, the Hospital Anxiety and Depression Scale, and the Linear Analogue Anxiety Scale. One-way ANOVA demonstrated homogeneity across the three groups on the pretest psychological scores. However, there was no significant reduction in posttest anxiety among groups.

The investigator documented some reasons of the non-significant result that the anxiety scores of the patients in this study were low or clinically non-significant for each psychometric instrument. It could not demonstrate significant group effects. The reasons may be from using denial as a coping mechanism and from the biased

selection criteria which was similar to Zimmerman's (1988) study. The effect size (0.19) of the intervention was low in this study. Basically, the small effect size is common for psychological intervention because it is complex and difficult to measure the psychological phenomenon (Polit & Sherman, 1990: 368). The sample size may be too small to detect occurrence of any significance (Burns & Grove, 1987: 222). Elliott (1994) suggested that increasing the sample size and increasing the number of intervention sessions may increase the effect size.

Likewise, Barnason et al. (1995) investigated the influence of selected nursing interventions on mood and anxiety in patients undergoing elective coronary artery bypass grafting during the early postoperative period. Ninety-six subjects undergoing elective coronary artery bypass grafting were randomly assigned into one of the three groups. In the music group, the subjects listened to the self-selected relaxing music. In the music-video group, the subjects received the self-selected soft instrument music combined with visual imaging on television. In the scheduled rest period group, the subjects had an undisturbed rest period. The subjects in each group received their assigned 30-minute intervention for two times on Day 2 and Day 3 postoperative. The subjects' anxiety was then measured by the State-Trait Anxiety Inventory (STAI) of Spielberger and Numeric scale (NRS). The chi-square and analysis of variance (ANOVA) were performed to statistically control for any differences of demographic characteristics among the groups. Because of the differences in the preoperative state, anxiety scores at baseline were used as a covariate. Analysis of covariance showed that there were no significant differences on anxiety levels of the three interventions at posttest.

Thus, the researchers explained the non-significant results that the exclusion criteria in this study prevented extremely critical patients from participating in the study. These patients would be more anxious than the hemodynamically stable CABG patient population. This total group overall in the study had relatively low levels of anxiety as measured by STAI and the ratings of subjects on the NRS. Therefore, the results may be different in a highly anxious group of patients. This explanation was again similar to Zimmerman's (1988) study.

Augustin and Hains (1996) studied the effect of music to reduce anxiety in ambulatory preoperative surgical patients. Forty-two patients were randomly assigned

to either the experimental or the control group. Both groups received routine preoperative procedures in the same way. The subjects in the experimental group listened to the self-selected music for 15 to 30 minutes, depending on the time left before surgery, while the subjects in the control group did not listen to music, but they could have some activities such as watching television, reading magazines, or talking to relatives or friends. The anxiety level was measured by the State-Trait Anxiety Inventory. There was no significant difference of baseline STAI scores between the two groups by a two-sample t-test. The results showed that there was no significant difference in anxiety between the two groups after the 20-minute intervention. However, the subjects in the experimental group demonstrated significant improvement from pretest to posttest across measures, including anxiety, heart rate, systolic blood pressure, diastolic blood pressure, and respiratory rate. In contrast, the subjects in the control group demonstrated some improvements such as systolic blood pressure and respiratory rate. The investigators concluded based on the results that preoperative teaching can adequately reduce most preoperative patients' anxiety. However, the self-selected music combined with the preoperative technique can be more beneficial than the preoperative instruction alone in decreasing anxiety of ambulatory surgery patients. The investigators noted some reasons of the non-significant results such as lack of control of the type of surgery procedure and use of a small sample size. The result would have better explained the effectiveness of music therapy on patients' anxiety if the investigators had controlled the extraneous factors such as type of the surgical procedure in this study.

Kaempf and Amodei (1989) examined the effects of sedative music on anxiety of patients in the holding area of the operating room. Thirty-three outpatients awaiting arthoscopic procedures were randomly assigned to either the experimental group (listened to classical music) or the control group during a 20-minute waiting period. The state portion of the State-Trait Anxiety Inventory (STAI) was used to test their anxiety. An independent t-test was used to compare each variable measurement between the two groups. Both groups were homogeneous at pretest. The results indicated that there was no significant difference of mean anxiety posttest scores between the two groups. The investigators explained that the patients might not

answer the self-reported questionnaire when they knew that they were asked questions about anxiety, but based their answers on social desirability instead.

In conclusion, the results of most studies showed that music therapy is an effective intervention to reduce anxiety. Although the results of some studies did not yield significance, music therapy is believed to decrease anxiety. In addition, some methodology problems were found in the non-significant findings. Most studies often used the State-Trait Anxiety Inventory (STAI) of Spielberger and the Numeric Scale of anxiety or mood as intruments to measure anxiety.

The Effect of Music Therapy on Physiological Responses in Clinical Care Settings

Music therapy can induce physiological responses through the influence of musical pitch and rhythm on the thalamus. Particularly, the immediate influence of soothing music can induce a hypometabolic response resulting in body relaxation. The indicators used to demonstrate the physiological relaxation responses include decrease in heart rate, respiratory rate, and blood pressure. Most studies have reported that music therapy is an effective intervention to promote relaxation, though some studies did not find any significance. However, the effects of music on physiological outcome variables, such as vital signs as a measure of relaxation responses, had been examined in a variety of studies. It could be concluded that music therapy had a trend to promote relaxation.

White (1992) examined the effects of relaxing music on decreased state anxiety in 40 patients with a confirmed medical diagnosis of acute myocardial infarction. Using the two-by-two analysis of covariance, the two groups did not show significant differences of baseline variables including heart rate and respiratory rate. Paired t-test demonstrated that the subjects in the experimental group who listened to relaxing music had a statistically significant decrease in heart rate and respiratory rate at posttest.

Likewise, Puang-Ngern (2001) tested the effectiveness of music therapy on anxiety, physiological response, oxygen saturation, and vital capacity in mechanically ventilated patients. Paired t-test revealed that subjects in the music period had a significantly greater decrease in heart rate, respiratory rate, and systolic blood pressure

than those in the control period. There was no statistically significant difference in diastolic blood pressure between the two conditions, however.

Similarly, Chlan (1998) tested the effects of music therapy on relaxation and anxiety reduction in patients with mechanical ventilation. There was no significant difference at baseline means of heart rate and respiratory rate between the groups by using independent t-test. The results of this study showed that the subjects in the music group had significantly lower heart rate and respiratory rate those in the control group.

Guzzetta (1989) examined the effect of relaxation and music therapy in reducing stress in patients with the presumtive diagnosis of acute myocardial infarction (AMI) in the coronary care. Eighty patients with AMI were randomly assigned into three groups: relaxation, music therapy (combined with relaxation technique), and control groups. The interventions in the experimental groups (relaxation and music groups) were participation lasting 20 minutes, twice a day, for a total of three sessions over a two-day period. The first guide of standard head-to-toe relaxation was used in both the relaxation and the music groups. In the relaxation group, the subjects were guided to practice the relaxation technique, which was modified from Benson's "respiratory one-method" from the investigator or assistant. In the music group, the subjects practiced the first guide of standard head-to-toe relaxation and received a self-selected relaxing tape. In the control group, the subjects received routine nursing care. Drug actions that might affect heart rate, blood pressure, vasodilation, or psychologic status were recorded for all patients during each day of the study. These drugs were analyzed by chi-square, and the result revealed that there was no significant difference in the proportion of patients among the three groups. ANOVA showed that patients in the music group and the relaxation group were significantly different in apical heart rate after three sessions. The incidence of cardiac complications was found to be lower in the intervention groups. However, in the music group, the relaxation technique was combined with music; the results might not be a true indicator of the effect of music therapy alone.

In addition, Augustin and Hains (1996) indicated that using self-selected music with preoperative teaching may be more advantageous than preoperative teaching alone in decreasing ambulatory surgery patients' anxiety. The subjects in the experimental group had significantly lower heart rate than those in the control group.

Diastolic blood pressure and respiratory rate of the subjects in the experimental group had a decrease that approached a statistical significance. However, by means of within-group analysis, the subjects in the experimental group showed a significant decrease in all physiological variables such as systolic blood pressure, diastolic blood pressure, heart rate, and respiratory rate, while in the control group, some of physiological variables of the subjects decreased significantly, including systolic blood pressure and respiratory rate. The investigators stated that the limitations of this study included using a small sample size and having no activity to control the subjects in the control group while awaiting the surgery, and that might have affected changes of vital signs. A larger sample size is suggested for further studies.

Kaempf and Amodei (1989) examined the effects of sedative music on anxiety of the patients in the holding area in the operating room. Systolic blood pressure and respiratory rate of both groups were homogeneous at pretest by using independent t-test. The results showed that only respiratory rates of the subjects in the music group were significantly lower than those of the subjects in the control group. Systolic blood pressure of both groups decreased significantly after 20 minutes of intervention, but the differences were not found. The authors explained that the results were in the right direction and the statistical significance may have been found if the sample size had been increased. There was no power analysis to determine the sample size in this study either.

Pensri Suharitdumrong (B.E. 2537) tested the effects of music therapy to reduce post–operative state anxiety in the patients with abdominal operation and mechanical ventilation. She also found that systolic blood pressure of the subjects in the experimental group (who listened to soothing Thai music) was significantly lower than that of the subjects in the control group. There was no significant difference in heart rates between the two groups.

On the contrary, Elliott (1994) tested the effect of music and muscle relaxation technique compared with the control group in reducing the anxiety of patients with ischemic heart disease in the CCU. One-way ANOVA demonstrated homogeneity across the three groups on the pretest physiologic variables (e.g., heart rate and blood pressure). The results showed that there were no significant differences in systolic blood pressure, diastolic blood pressure, and heart rate between the three groups at

posttest. Several reasons for the non-significance of the treatment were discussed. First, the sample size was small. The effect size and power in this study were also small (0.20 and 0.22, respectively). The low effect size demonstrated that this intervention had a small effect on the dependent variables: heart rate and blood pressure (Burns & Grove, 1987: 222). Increasing the sample size would increase the power of the test (Polit & Sherman, 1990: 365). The investigator proposed that to achieve a power level of 0.80 or greater with the other factors constant, a sample size should be 80 per group and the intervention sessions should be increased. Second, physiological responses such as heart rate and blood pressure were measured according to the routine observation time of the CCU. From a literature review, music therapy can induce the relaxation response immediately (Wells-Federman et al., 1995: 61). In this study, after the intervention, the measurement was not performed immediately, and the outcomes might not be the peak effect. In addition, the activity between the measurement, which the investigator did not control, may disturb the patients' vital signs. Lastly, the medication control, which may affect vital signs, was not reported in this study.

Some studies similarly reported non-significant results of music on physiological outcomes. Zimmerman et al. (1988) investigated the effects of listening to a relaxation type of music on self-reported anxiety in patients with suspected myocardial infarction. The investigator reported that there were no significant differences among three groups in systolic blood pressure, diastolic blood pressure, and heart rates when using repeated measure ANOVA. However, when analysis of a combination of three groups was performed, it was found that there was a statistically significant improvement over time for all subjects, as a total group, in systolic blood pressure, diastolic blood pressure, and heart rates. The investigators provided some explanations. The physiologic parameters were improved when all subjects were combined as the total group. It reflected that the rest intervention might affect the physiologic parameters for patients in the critical care units. This study did not report the power level and effect size. The investigators suggested that a larger sample with various levels of anxiety be used and the music should be provided more than once per day. In addition, the medication that might affect physiologic responses was not controlled in this study.

Barnason et al. (1995) investigated the influence of selected nursing interventions (music or music-video) during the early postoperative period on mood and anxiety of 96 patients who underwent elective coronary artery bypass graft. The results showed that there were no significant interactions between the intervention and time for any of the physiologic variables, yet there was a significant main effect over time for heart rate, systolic blood pressure, and diastolic blood pressure regardless of groups. It was found that a generalized relaxation response occurred within the first ten minutes from the baseline and continued for the remaining study period.

The investigators recommended that three interventions (music, music-video, and scheduled rest) as the relaxation method for nursing intervention be used when the post operative patients had a stressful situation. In addition, the confounding variables were reported. The investigator did not control pain management and medication use of cardiovascular conditions after surgery. These factors might affect the physiological responses (e.g., heart rate, systolic blood pressure, and diastolic blood pressure).

Wong et al. (2001) examined the effects of relaxing music on state anxiety scores in 20 ventilator dependent patients. Analysis of variance with repeated measures showed that there were no significant differences in blood pressure and respiratory rate between two conditions (the music or the control period) over times. However, by within-group analysis, at the end of the intervention, blood pressure and respiratory rate of the subjects in the music condition decreased more greatly than those of the subjects in the control condition, and this demonstrated the relaxation responses. Drug action might also affect physiological response outcomes. Paired t-test analysis revealed that there were no significant differences in the baseline data between the subjects who received these medications and those who did not receive these medications. The reasons for non-significance of physiologic variables were explained by the investigator. First, there were no significant differences in baseline data of blood pressure and respiratory rate when comparing two conditions at pretest. Second, it may be possible that that type II error occurred as a result of the small sample size. Third, activities of daily living of patients were not controlled before each condition. These factors may have affected vital signs.

From a systematic review, music therapy in hospitals was conducted to reduce anxiety. A meta-analysis evaluates the impact of music therapy on physiological

variables such as heart rate, blood pressure, and respiratory rate. In the systemic review, findings also revealed that only respiratory rate has decreased slightly (Evans, 2001: 3). However, some of the studies were excluded from the review because of the research methodological problem and the low power level. In summary, Evans stated that the results of this review may be a lack of evidence rather than a lack of effect (Evans, 2001: 5). Because most studies regarding music therapy had a small sample size, it was difficult to find significance of the intervention.

The Effect of Music Therapy on Weaning Parameters in Clinical Care Settings

Music therapy can induce the relaxation response, which leads to generalized decrease in central nervous system arousal, resulting in decreased work of breathing as well as improved weaning parameters. Weaning parameters in this study are objective criteria used to predict the readiness of patients to successfully sustain spontaneous ventilation and maintain adequate oxygenation (Manthous, et al., 1998: 886), including oxygen saturation, tidal volume, and rapid shallow breathing index (f/V_T).

These weaning parameters were part of respiratory assessment, which was used to evaluate pulmonary mechanic and pulmonary gas exchange of the readiness to wean in patients relying on ventilator. In the literature review, there was no reported finding of the effect of music therapy on patients during weaning from mechanical ventilation. However, the findings of some studies demonstrated the effects of music therapy on improved relaxation response by improving pulmonary mechanic and pulmonary gas exchange.

Puang-Ngern (2001) tested the effectiveness of music therapy on anxiety, physiological responses, oxygen saturation, and vital capacity in mechanically ventilated patients. Pulmonary functions as indicators of relaxation response were vital capacity and oxygen saturation. The results showed that vital capacity and oxygen saturation of the subjects during the music therapy period increased more than those in the control period with statistical significance.

Burke, et al. (1995) investigated infants requiring continued ventilatory support. They reported the improvement of oxygen saturation in four neonates during the tape music intervention when compared with the control condition. The investigators

suggested that music was effective in reducing stress-related behaviors for some infants.

As for contrary findings, in outpatients receiving procedures, Dubois, et al. (1995) investigated the effect of music during bronchoscopy on patients' perception of the procedure. The results of the study demonstrated that there was no difference in oxygen saturation between groups, but the subjects in the music group reported significantly greater comfort and less cough than those in the control group.

Summary

Music therapy has been used as an intervention to improve physiological relaxation in many clinical settings, but the results of some studies did not show statistical significance. From a literature review, the small sample size is the most frequent reason for such non-significance. Few studies used power analysis to determine the power level, and other studies did not control extraneous factors adequately, which may have interfered with the results.

Also, music therapy has been used as an intervention to promote healing since the former time. The characteristics of music that can reduce anxiety and promote relaxation are, for example, soothing, non-lyric, and minimally rhythmic. Music therapy was used as an effective nursing intervention to reduce anxiety in several studies (Chlan, 1998; Lueders-Bolwork, 1990; Pensri Suharitdumrong, B.E. 2537; White, 1992). In addition, music therapy has been found to be useful as an intervention to improve physiological relaxation. Psychophysiological responses (e.g., decreased anxiety and physiological responses) are affected by the influence of the musical pitch and rhythm on the limbic system. Music may decrease the autonomic nervous response shown by decreases in heart rate, respiratory rate (Chlan, 1998; Puang-Ngern, 2001; White, 1992), blood pressure (Puang-Ngern, 2001), muscle tension, and oxygen consumption (Benson, 1975: 67-68). Therefore, the results from the literature review lend support to the notion that music may promote relaxation responses and reduce anxiety in patients during weaning from mechanical ventilation.

CHAPTER III
MATERIALS AND METHODS

This chapter presents the research design and methods that were used to conduct this study. The chapter includes descriptions of the research design, population and sampling, procedures for data collection, protection of human subjects, instrumentation, and procedures for data analysis.

Research Design

This study used a crossover experimental design, which aimed to compare changes on the anxiety level, physiological responses, and weaning parameters of patients during weaning from mechanical ventilation in the two periods: intervention and control periods. In the intervention period, the patients received a 30-minute music therapy, whereas in the control period, the patients did not receive the music therapy, but received a 30-minute uninterrupted rest during weaning from mechanical ventilation.

Population and Sampling

The target population in this study was the patients during weaning from mechanical ventilation. Purposive sampling was used to recruit the sample from three settings: the Intermediate Care Unit (7NW), the Intensive Care Unit (ICU), and the Coronary Care Unit (CCU) at Ramathibodi Hospital, Bangkok, Thailand, from July 2002 to February 2003.

The inclusion criteria were as follows:

1. being 18 years of age or older;
2. being able to understand the Thai language;
3. being alert and oriented to place, time, and person;
4. having no hearing problems;

5. receiving a physician's prescription for weaning from mechanical ventilation; and
6. being allowed by his/her primary physician to participate in the study.

The exclusion criteria included:

1. Failure to wean during either the intervention or control periods based on the weaning indicators, modified from Burns (1999: 475-476), Burns (2001: 198), and Sumalee Kredboonsri (B.E. 2545: 333) as follows:
   - Respiratory rate increasing to 30 breaths /minute (sustained);
   - Oxygen saturation falling to < 91 % or 2% below baseline (sustained);
   - Heart rate increasing by 20% (sustained) such as increasing more than 20 beats/minute;
   - Systolic blood pressure > 180 mmHg, or < 90 mmHg;
   - Tidal volume decreasing < 200 cc;
   - Excessive anxiety or agitation;
   - Diaphoresis;
   - Excessive dyspnea; and
   - Changes of mental status and behavior; and
2. receiving any new antihypertensive or adrenergic drugs.

Sample Size

According to Polit and Hungler (1987), the sample size selected should be at least ten, and favorably 20 to 30 cases in each group for comparison by the study design (Polit & Hungler, 1987: 220). Because this study used a crossover design, by which the subjects were treated as their own control (Polit, et al., 2001: 177) throughout the intervention and the control periods, the number of the subjects recruited was 20, which allowed a comparison of 20 pairs. The level of significance, an alpha level of .05, was used, which is usually acceptable as the standard for the alpha criterion (Polit & Sherman, 1990: 365-366).

Settings

The research settings for this study included the Intermediate Care Unit (7NW), the Intensive Care Unit (ICU), and the Coronary Care Unit (CCU) at Ramathibodi Hospital, Bangkok, Thailand, from July 2002 to February 2003. The rationale for selecting these three units was that the personnel used the same criteria and had the same practice for weaning the patients from mechanical ventilation.

Instrumentation

The instruments of this study were composed of two parts as follows:

1. Experimental Instruments:

1.1 A portable compact disk player (Sony Model No. D-FJ65)

1.2 Compact disks of the natural music collection including the sound of wind, stream, sea, and songbirds. This soothing music was used as a music therapy to reduce anxiety and physiological responses in patients with mechanical ventilation (Puang-Ngern, 2001).

The selected natural music for this study was as follows:

1.2.1 Songbird sounds, which were composed, arranged, and performed by John Herberman and produced by Gordon Gibson. The music included the series of New England Spring, Northern Mist, Coastal Horizons, Prairie Glory, and Dawn in the Valley;

1.2.2 Stream sounds, which were composed and performed by Michael Maxwell and produced by Gordon Gibson. The music included the series of Pool of Mirrors, The Repose, Quiet Longing, and After the Rain;

1.2.3 Sea sounds, which were adapted, arranged, and performed by Michael Maxell and produced by Gordon Gibson. The music included the series of Beyond the Horizon, In a Protected Cove, Forever by the Sea, and Timeless and Free;

1.2.4 Wind sounds, which were arranged and produced by Eclipse Music Group. The music included the series of Riding the Wind.

All natural sound collections were distributed by Solitudes Ltd.,Toronto, Canada.

1.3 Headphones (Sony MDR-101LP) with ear-pad sponges, which were changed for each subject;

1.4 A portable bedside monitor of Nihon Kohden Model Series No.BSM 2301K, which was a noninvasive, automatic device and could be preset for measurements at specific time intervals. Blood pressure, heart rate, and oxygen saturation parameters were recorded on a bedside monitor model Nihon Kohden. This bedside monitor was calibrated by K.K. Medical Company before using in this study to ensure the accuracy of the instrument;

1.5 Wright Spirometer (Ferraris Series No. HS 28433 at the Intensive Care unit (ICU), Ohmeda Series No. AAPW 60132 at the Intermediate Care Unit (7NW), and Ohmeda Series NO. AAPW 60185 at the Coronary Care Unit (CCU), which were used to measure tidal volume for weaning parameters. These three Wright spirometers were calibrated by Inhalator Unit of Ramathibodi Hospital, Bangkok, Thailand, to ensure the accuracy of the instruments;

1.6 A Poster "Please do not disturb" which was used at specific interval times; and

1.7 Eye pads.

2. Data Collection Instruments

In this study, the data collection instruments consisted of six questionnaires as follows:

2.1 Demographic Data Questionnaire, which elicited information including gender, age, ethnicity, religion, educational level, marital status, occupation, monthly family income, and method of payment for hospital charge (Appendix B, Part I).

2.2 Clinical Data Record, which included data of current medical diagnosis, underlying disease, length of hospital stay, duration of using mechanical ventilation, duration of weaning, route of intubated artificial airway, current weaning method, weaning prescription, experience with weaning from mechanical ventilation, experience with admission in the critical care unit, current medication use, and previous use of relaxation techniques when stressful (Appendix B, Part II).

2.3 Personal Music Preference Questionnaire, including data of the patients' music preferences and habit of listening to music (Appendix B, Part III).

2.4 The Numeric Rating Scale (NRS) of Anxiety Measurement, of which the score ranged on a 10-point scale from 0 to 10 (0 = no anxiety and 10 = as much anxiety as one could possibly have) (Appendix B, Part IV). The NRS was a derivation

of the Visual Analogue Scale (VAS), which was used to measure psychometric properties with the interval scale. From a review of VAS in the measurement of clinical phenomena, the reliability coefficients of the VAS with repeated measures in two studies (in patients with post-operative dental pain within a few minutes and memory of a distant pain event after 5 minutes and 24 hours in patients with post-operative dental pain) ranged from 0.95 to 0.99 (Wewers & Lowe, 1990: 230). The VAS could be used to measure anxiety among patients in the critical care unit while on a ventilator because these subjects had short-attention time, stress, restricted movement, and generally poor vision (Cline et al., 1999: 249). Although the sensitivity of the NRS was less than the VAS, the NRS demonstrated the appropriateness and the usefulness in the critical care unit (Barnason et al., 1995; Puang-Ngern, 2001) (Appendix B, Part IV).

2.5 Physiological and Weaning Parameters Records (Appendix B, Part V), including data about physiologic variables (heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and respiratory rate), and weaning parameters (oxygen saturation, tidal volume, and rapid shallow breathing index). Heart rate, blood pressure, and oxygen saturation were measured by an automatic portable bedside monitor, except for the respiratory rate using counting the chest wall movement in one minute. Tidal volume was measured by Wright spirometer. Rapid shallow breathing index (RSBI) was calculated by the following formula:

$$RSBI = F/V_T$$

F is frequency of respiratory rate (breaths/minute).

V_T is tidal volume (litre).

Because of $V_T = \frac{\text{minute volume}}{F}$

$$F/V_T = \frac{F^2}{\text{Minute volume}}$$

(Sumalee Kredboonsri, B.E. 2545: 319-320).

2.6 The Questionnaire of Satisfaction with Music Therapy, which evaluated the subjects' satisfaction with the music therapy during weaning from mechanical ventilation. This questionnaire included questions about the satisfaction with the

usefulness and the appropriateness of the music used regarding the type, duration, and frequency (Appendix B, Part VI).

Protection of Human Subjects

The research proposal was approved by Committee on Human Rights Related to Research Involving Human Subjects of the Faculty of Medicine, Ramathibodi Hospital, before the data were collected. The eligible subjects were approached and asked to participate in the study. The researcher introduced herself to the subjects and asked for their participation by explaining the study objectives, the data collection process, and expected research outcomes. The subjects were informed that they had the rights to refuse or agree to participate in the study (Appendix A). In addition, the subjects were assured that their participation in this study or refusal would not affect their relationship with the personnel in the hospital and the treatment they received. They were also assured that the data collection from them would be kept confidential.

Data Collection

The data collection was conducted by the researcher in the following steps:

1. The data collection procedures began after the approval was obtained from the Dean of the Faculty of Graduate Studies, Mahidol University, the head of Department of Medicine, and the Director of Nursing Department of the Faculty of Medicine Ramathibodi Hospital. Also, the heads of the intermediate care unit, the intensive care unit, and the coronary care unit were contacted.

2. Recruitment of the subjects was conducted based on the inclusion criteria and the human subject protection procedures. The subjects were approached when they received a plan for weaning from mechanical ventilation using either T-piece trial, the external continuous positive airway pressure (CPAP), or the CPAP mode with pressure support (PS) of ventilator, (PS < 10 cmH_2O in the patients who had an endotracheal tube and PS < 5 cmH_2O in the patients who had a tracheostomy tube).

3. Regarding the human subject protection procedures, all eligible subjects were approached by the researcher. The informed consents were obtained from the subjects to ensure that they were willing to participate in the study.

4. Once the subjects agreed to participate in this study, demographic and clinical characteristics were obtained from the chart and the subjects' relatives. The subjects were interviewed personally regarding their music preferences. The subjects listened to the sample of the natural music compact disk (the sound of songbirds, stream, sea, and wind), and then selected one choice to use during the music intervention period.

5. According to the crossover design used in this study, each subject was exposed to both the intervention period (receiving a 30-minute music period) and the control period (receiving a 30-minute uninterrupted rest without music). The interval between the control and the intervention periods was at least three hours on the same day to prevent the possible carryover effect on the anxiety measurement.

6. The sequence of being in the two different conditions (music/rest or rest/music) was randomly assigned by drawing lots without replacement. The number of the ballots identifying the sequence (music/rest or rest/music) were equal in the box. Each subject drew a ballot for the condition by himself/herself. This method would assure that the number of the sequence of different conditions of subjects in the intervention and control periods were equal with reduced selection bias.

7. The experiment was begun in the morning after the weaning plan was readily set by the physician. The visiting period of the unit was avoided so that the experimental procedure and the interaction between the subjects and their family would not interrupt each other.

8. Some extraneous variables that might be a concern in this study included bronchodilator, cardiovascular, or anticholinesterase medication that the subjects were prescribed. If the subjects were prescribed these medications, the manipulation would be started before the administration of the medication both in the intervention and control periods. However, in any circumstances, if the subjects received these medications before the study manipulation began, the condition of the subjects both in the intervention and control periods would be set as closest to each other as possible. The equivalent condition of the medication received was important to control the extraneous factors. If the subjects received more than one medication set in different schedules, the timeframe of the manipulation was carefully considered and data collection was carefully conducted to equalize the intervention and control conditions.

9. If the weaning of the subjects did not progress well, according to the weaning criteria, the study would be postponed until the subjects could tolerate the weaning; that is, showing no sign of intolerance of weaning. That is, the patients would not have dyspnea and have acceptable arterial blood gas, stable hemodynamic, and unchanged neurological signs and symptoms (Knebel, 1991: 329-330). These subjects were approached to participate in the study again, if they met the inclusion criteria. The most common weaning parameters included spontaneous tidal volume ≥ 5 ml/kg, vital capacity ≥ 10-15 ml/kg, and minute ventilation ≤ 10 L/min (Burns, 2001: 196). Thus, the assessment of the appropriateness of clinical conditions and weaning parameters must be ongoing to reflect the patients' ability for weaning.

10. Data collection was performed by the researcher only. The researcher stayed with the subjects throughout the process of weaning to monitor their physiological responses and weaning parameters.

Intervention Period

In the intervention period, the following procedures were conducted:

1. To promote the calm environment, a curtain with a poster "Please do not disturb" was posted. The subjects were asked to be in their comfortable position and to close their eyes while listening to the melody of music. The subjects listened to a self-selected natural music for 30 minutes via headphone from a compact disk player, which was set to turn off automatically. They could control the music volume by themselves. However, the researcher stayed with the subjects to monitor their physiologic changes to ensure their safety.

2. The parameters were assessed as follows:

-Anxiety Level: The subjects were asked to rate their overall perception of anxiety on the NRS from 0 to 10 at immediately before and after the manipulation.

-Physiologic responses (heart rate, respiratory rate, and blood pressure): Heart rate and respiratory rate were measured at the 5-minute point before the music intervention began, at the beginning, and then every five minutes until ten minutes after the 30-minute music therapy ended. However, blood pressure parameters (systolic, diastolic, and mean arterial pressure) were measured at the 5-minute point before the music intervention began, at the beginning, and then every ten minutes until

the ten minutes after the 30-minute music therapy ended. All physiologic variables were measured by an automatic portable bedside monitor, except for the respiratory rate using counting the chest wall movement in one minute.

-Weaning parameters (oxygen saturation, tidal volume, and rapid shallow breathing index): Oxygen saturation was measured every five minutes, with the same schedule as heart rate and respiratory rate. Tidal volume and rapid shallow breathing index were measured and recorded at immediately before and after the manipulation.

The rationale for measuring blood pressure, tidal volume, and rapid shallow breathing at the schedules different from other parameters was that the procedure of blood pressure measurement needed much involvement of the subjects, which in turn, disturbed other study parameters.

3. The subject satisfaction with the music therapy during weaning from mechanical ventilation was also assessed in terms of type, duration, and usefulness of music. These data might be useful to plan nursing interventions for patients during weaning from mechanical ventilation in the future.

The Control Period

All procedures and measurements in the control period were the same as those in the intervention period, except that there was no music through the headphones. The usefulness of the headphones in the control period was to minimize the noises in the environment and to assure the similar procedures between the intervention and control periods. The headphones used for these purposes were reported in previous studies (Chlan, 1998; Puang-Ngern, 2001; Wong et al., 2001).

Data Analysis

All data were analyzed using the Software Package of Social Statistics (SPSS) for Windows version 9 (2002) in as the following procedures:

1. The demographic and clinical characteristic data were reported by descriptive statistics such as frequency, percentage, range, mean, and standard deviation.

2. The personal music preference and satisfaction with the music therapy were reported by frequency and percentage.

3. Paired t-test was used to compare the mean change of the anxiety level, heart rate, blood pressure, respiratory rate, oxygen saturation, tidal volume, and rapid shallow breathing index between the music therapy period and the non-music therapy period.

CHAPTER IV
RESULTS

This chapter presents the results of data analyses, which are divided into two sections: the descriptive data of the study sample and the results for hypotheses testing.

Part I. Descriptive Data of the Study Sample

Demographic Characteristics

The sample in this study consisted of 20 subjects. Initially, 31 subjects entered the study. However, eleven subjects were withdrawn from the study, in accordance with the exclusion criteria. According to the crossover design in this study, each subject needed to complete both periods: the control and intervention periods, by which the sequence of manipulation (music/rest or rest/music) was randomly assigned. Eleven subjects withdrew from the study; eight subjects completed only one manipulation period during the data collection because of their dyspnea (n = 3), unstable hemodynamic (n = 1), early extubation prior to the second intervention (n = 2), irritable feeling (n = 1), and poor past experience about his imagination during the music therapy (n = 1). Three subjects quit the study because of their dyspnea and discomfort symptoms, having much secretion in the endotracheal tube and oral cavity and hiccough.

Thus, a sample of 20 subjects who completed both the music therapy and the control periods were analyzed in this study. The subjects were exposed to two conditions: music therapy and control periods. The interval between the two conditions ranged from three to seven hours with a mean of 3.89 hours (SD = 0.97). The sample consisted of eleven Thai males (55%) and nine Thai females (45%). Their ages ranged from 22 to 82 years with a mean age of 49.70 years (SD = 19.39). The majority of the sample were Buddhist (n = 19, 95%), married (n = 15, 75%), and completed elementary school (n = 9, 45%). Most subjects were unemployed (n = 11,

55%), and they had monthly family income ranging from 5,001 to 15,000 Baht (n = 10,50%). Regarding the method of payment for hospital charges, most subjects paid for hospital charges using the government welfare scheme (n = 8, 40%), followed by the Universal Coverage scheme—an insurance system that the government has established for people to receive health care services with their own payment of 30 Baht per visit (n = 6, 30%), and the social security scheme (n = 5, 25%). Only one subject paid for the hospital charge by himself (Table 4).

Table 4. Frequency and Percentage of the Sample's Characteristics (N = 20)

Demographic Characteristics	Frequency (N = 20)	Percentage (%)
Gender		
Male	11	55
Female	9	45
Age		
21-40 years	8	40
41-60 years	7	35
Over 60 years	5	25
Ethnicity		
Thai	20	100
Religion		
Buddhist	19	95
Islam	1	5
Educational level		
No formal education	1	5
Elementary school	9	45
Middle school	2	10
High school	2	10
Post high school	1	5
College and higher	5	25

Table 4. Frequency and Percentage of the Sample's Characteristics (N = 20) (Continued)

Demographic Characteristics	Frequency (N = 20)	Percentage (%)
Marital Status		
Single	4	20
Married	15	75
Widowed/ Divorced	1	5
Occupation		
Unemployed/Retired	11	55
Employee	4	20
Self-employed	3	15
Government Official/State Enterprise Employee	2	10
Monthly Family Income (Baht)		
< 5,000	3	15
5,001-10,000	5	25
10,001-15,000	5	25
15,001-20,000	3	15
20,001-25,000	2	10
> 25,000	2	10
Method of Payment for Hospital Charge		
Reimbursement from the government welfare scheme	8	40
Universal Coverage scheme	6	30
Social security scheme	5	25
Self-paid	1	5

Current Medical Diagnoses and Underlying Diseases

As shown in Table 5, the most common current medical diagnoses were respiratory-related problems (n = 10, 50%) such as chronic obstructive pulmonary

disease (n = 3, 15%) and pneumonia (n = 2, 10%). Cardiovascular and circulatory problems were the second common problem such as septic shock (n = 2, 10%), superior vena cava obstruction (n = 1, 5%), congestive heart failure (n = 1, 5%), and acute myocardial infarction (n = 1, 5%). Neuromuscular problems were the third common problem such as myasthenia gravis (n = 3, 15%).

Only one subject in this study did not have any underlying disease. Nine of those who had an underlying disease had more than one underlying disease. Cardiovascular problems were reported as the most frequent underlying disease (47.4%), follow by the respiratory problems (31.6%).

Table 5. Frequency and Percentage of the Sample's Current Medical Diagnosis and Underlying Disease

Clinical Characteristics	Frequency (N = 20)	Percentage (%)
Respiratory-related problem		
-Chronic obstructive pulmonary disease	3	15
-Pneumonia	2	10
-Pulmonary congestion/edema	2	10
-Bronchiectasis	1	5
-Upper airway obstruction	1	5
-Acute asthma attack	1	5
Cardiovascular and circulatory problems		
-Septic shock	2	10
-Superior vena cava obstruction	1	5
-Congestive heart failure	1	5
-Acute myocardial infarction	1	5
Neuromuscular problem		
-Myasthenia gravis	3	15
-Duchenne muscular dystrophy	1	5
Others:		
-Postoperation: Explore laparotomy with subtotal total abdominal hysterectomy	1	5

Table 5. Frequency and Percentage of the Sample's Current Medical Diagnosis and Underlying Disease (continued)

Clinical Characteristics	Frequency (N = 20)	Percentage (%)
Underlying disease		
No	1	5
Yes* (system)	19	95
-Cardiovascular	9	47.4
-Respiratory	6	31.6
-Endocrinology	5	26.3
-Neuromuscular	4	21.1
-Nephrology	4	21.1
-Hematology	2	10.5
-Oncology	2	10.5
-Central nervous system	1	5.3

*One subject might have more than one underlying disease.

Characteristics Related to Weaning from Mechanical Ventilation

Duringt the data collection period, almost all of the sample were intubated with an oral endotracheal tube (n = 18, 90%). Only two subjects (10%) had a tracheostomy tube. Most subjects were prescribed with the external continuous positive airway pressure (CPAP) weaning method (n = 11, 55%), followed by T-piece trial (n = 5, 25%) and the CPAP mode with pressure support of ventilator (n = 4, 20%) (see Table 6). The subjects who were prescribed a weaning method with ventilator of CPAP used pressure support adjuncts (< 10 cm. of water for those with an endotracheal tube; < 5 cm. of water for those with a tracheostomy tube). The oxygen concentration given to the subjects ranged from 30% to 40%.

One-fourth of the subjects experienced on admission in the critical care unit (n = 5) and four subjects experienced a previous intubation and receiving weaning from mechanical ventilation. Only five subjects reported previous use of relaxation techniques when stressful such as music (n = 4) and meditation (n = 1) (Table 6).

Table 6. Frequency and Percentage of the Sample's Characteristics Related to Weaning from Mechanical Ventilation

Clinical Characteristics	Frequency (N = 20)	Percentage (%)
Route of intubation artificial airway		
Oral endotracheal tube	18	90
Tracheostomy	2	10
Current weaning method		
External continuous positive airway pressure (CPAP)	11	55
T–piece trial	5	25
CPAP mode with pressure support of ventilator	4	20
Experience of weaning from mechanical ventilation		
No	16	80
Yes	4	20
Experience of admission in the critical care unit		
No	15	75
Yes	5	25
Previous use of the relaxation technique when stressful		
No	15	75
Yes		
-Meditation	1	5
-Music	4	20

Current Medication Use

The medications, which might affect outcome variables, that the subjects currently received were bronchodilators, cardiovascular medications, and aniticholinesterase agents, respectively. Of the subjects who used medications, seven patients (50%) received beta adrenergic agonist, followed by xanthines (n = 6, 42.9%), and anticholinergic drug combined with adrenergic agonist (n = 6, 42.9%) (see Table 7).

Table 7. Frequency and Percentage of the Sample's Current Medication Use

Clinical Characteristics	Frequency (N = 20)	Percentage (%)
Current medications used		
No	6	30
Yes*	14	70
Bronchodilators		
Beta adrenergic agonist	7	50
Xanthines	6	42.9
Anticholinergics combined with Beta adrenergic agonist	6	42.9
Cardiovascular drugs		
Angiotensin II antagonists	2	14.3
Beta adrenergic receptor	1	7.1
Alpha adrenergic receptor	1	7.1
Antiarrhythmic	1	7.1
Vasodilator	1	7.1
Anticholinesterase drug		
Mestinon	3	21.4

*One subject might receive more than one type of medication.

The mean length of hospital stay of the sample ranged from 3 to 75 days (2.5 months), with a mean of 13.15 days (SD = 17.30) and a mode of three days. The mean duration of using mechanical ventilation ranged from 2 to 75 days, with a mean of 10.35 days (SD = 16.26) and a mode of three days. The mean duration of weaning from mechanical ventilation ranged from one to seven days, with a mean of 1.95 days (SD = 1.50) and a mode of one days (see Table 8).

Table 8. Mean of the Sample's Length of Hospital Stay and Duration of Using the Mechanical Ventilation and Duration of Weaning from Mechanical Ventilation

Clinical Characteristics	Mode (Day)	Mean (SD) (Day)	Range (Day)
Length of hospital stay	3	13.15(17.30)	72(3-75)
Duration of using mechanical ventilation	3	10.35(16.26)	73(2-75)
Duration of weaning from mechanical ventilation	1	1.95(1.50)	6(1-7)

Part II. Hypotheses Testing

To test the effect of music therapy on the anxiety level, physiological responses, and weaning parameters of subjects who were weaning from the mechanical ventilation, the paired t-test was used. According to the t-test, the assumption of normality of the dependent variable should be met (Munro, 1997: 125). The dependent variable in Hypothesis 1 was the mean change of the anxiety level. The dependent variables in Hypothesis 2 were the mean change of physiologic responses (i.e., heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure-MAP, and respiratory rate). The dependent variables in Hypothesis 3 were the mean change of weaning parameters (i.e., oxygen saturation, tidal volume, and rapid shallow breathing index).

The Kolmogorov-Smirnov one-sample test was used to test the normality of the dependent variables. In general, the non-significant result ($p >. 05$) indicates the normality of the variable (Huck, & Cormier, 1996: 521). The test indicated that all dependent variables in this study (the mean change of the anxiety level, heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, respiratory rate, oxygen saturation, tidal volume, and rapid shallow breathing index) met the normality assumption over time throughout the manipulation period, except the mean change of oxygen saturation at 5, 10, 15, and 20 minutes that did not meet the assumption of normality in the control period.

The results of hypothesis testing are presented as follows:

Hypothesis 1: The anxiety level of patients weaning from mechanical ventilation during the music therapy period decreases more than during the uninterrupted rest period without music therapy.

Anxiety is defined as emotional reactions of a person who perceives a specific situation as threatening or dangerous at the moment (Spielberger, et al., 1983: 1). Anxiety is measured by the Numeric Rating Scale (NRS) of anxiety with scores ranging from 0 to 10. Anxiety at pretest and at posttest was measured at immediately before and after the manipulation, respectively.

Table 9. A Comparison of the Mean Change of the Anxiety Scores between the Music Therapy Period and the Control Period (N = 20)

Manipulation	Before		After		Mean change (After - Before)		t-value
	M	SD	M	SD	M	SD	
Music	5.25	2.00	3.10	2.77	-2.15	2.83	-3.102*
No music	4.05	2.42	4.05	2.95	0	1.56	

Note:* $p < .05$; - = decrease from beginning.

To determine the effect of music therapy on the anxiety scores, the data were analyzed by comparing the mean change from pre-test to post-test in the intervention period and in the control period. As shown in Table 9, paired t-test showed that the mean change of the anxiety level of subjects in the music therapy period more significantly decreased than in the control period [$t(19) = -3.102$, $p < .05$] in weaning from mechanical ventilation. Thus, Hypothesis 1 was accepted.

Hypothesis 2: Physiological responses (heart rate, blood pressure, and respiratory rate) of patients weaning from mechanical ventilation during the music therapy period decrease more than during the uninterrupted rest period without music therapy.

Physiological responses in this study are defined as clinical parameters that monitor clinical conditions of the subjects in this study including heart rate, blood

pressure (systolic blood pressure, diastolic blood pressure, and mean arterial pressure), and respiratory rate.

Heart Rate

Heart rate was measured by a portable bedside monitors of Nihon Kohden Model Series No. BSM 2301K, which was a noninvasive device that was fully automatic and could be preset for measurements at specific time intervals.

The means of heart rate of both the music therapy period and the control period displayed a decline over time until at 25 minutes from the beginning, and then displayed a slightly ascending trend in both periods (see Table 10 and Figure 3).

Table 10. Mean of Heart Rate Over Time between the Music Therapy Period and the Control Period (N = 20)

Heart rate over time	Music Therapy Period		Control Period	
	M (BPM)	SD	M (BPM)	SD
5 mins before beginning	98.00	17.45	98.05	16.39
Beginning	97.40	16.71	96.55	15.34
5 mins	96.05	17.39	97.15	15.47
10 mins	95.20	16.97	95.00	16.96
15 mins	95.45	15.56	94.25	16.05
20 mins	94.30	15.63	93.50	16.54
25 mins	93.05	16.52	93.10	17.22
30 mins	95.00	17.50	95.45	16.93
5 mins after*	94.35	18.07	94.65	16.52
10 mins after*	96.85	15.49	95.30	17.70

Note: BPM = beats per minute; *after = after the manipulation ended.

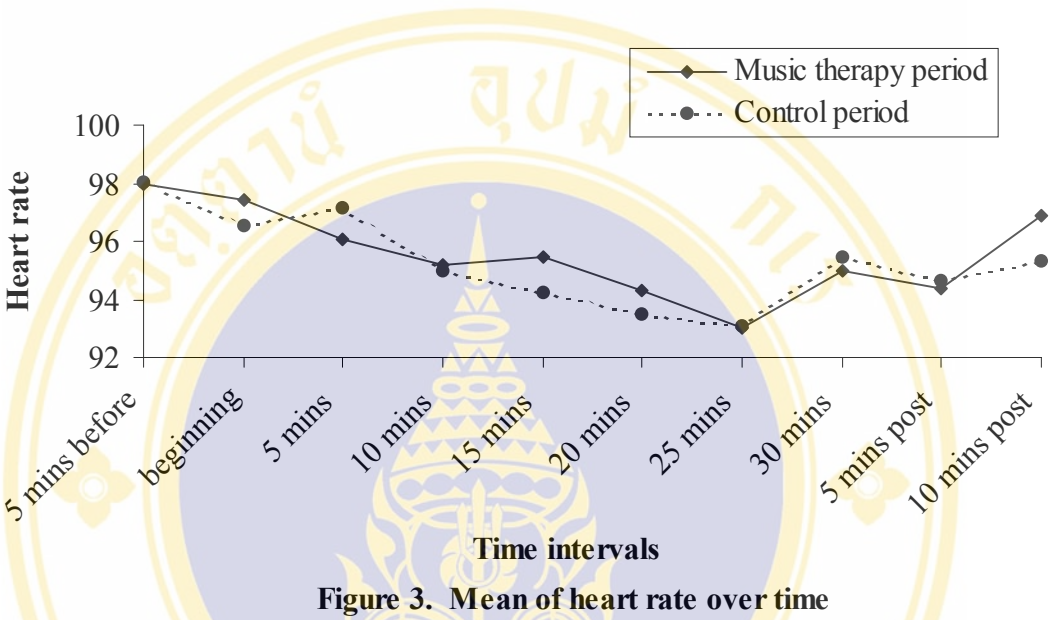

Figure 3. Mean of heart rate over time

Paired t-test was used to detect the difference mean change of heart rate of the subjects in the music therapy period and in the control period. The analysis showed that there were no significant differences in the mean change of heart rate over time between the subjects in the two periods ($p > .05$). The mean change of heart rate of subjects in the music therapy ranged from -1.35 to -4.35 beats per minute (BPM), whereas it ranged from 0.60 to -3.45 BPM in the control period during the first 30 minutes of the manipulation (Table 11).

Table 11. A Comparison of the Mean Change of Heart Rate Over Time between the Music Therapy Period and the Control Period (N = 20)

Heart rate over time	Music Therapy Period		Control Period		t-value	p-value
	Mean change (BPM)	SD	Mean change (BPM)	SD		
Beginning-5 mins	-1.35	4.06	0.60	3.87	-1.588	.129
Beginning-10 mins	-2.20	4.54	-1.55	5.07	-.464	.648
Beginning-15 mins	-1.95	4.32	-2.30	5.26	.224	.825
Beginning-20 mins	-3.10	5.45	-3.05	5.43	-.028	.978
Beginning-25 mins	-4.35	5.16	-3.45	6.57	-.480	.636
Beginning-30 mins	-2.40	6.82	-1.10	7.06	-.587	.564
Beginning-5 mins after *	-3.05	7.55	-1.90	6.92	-.519	.609
Beginning-10 mins after *	-0.55	6.09	-1.25	6.73	.334	.742

Note: Mean change = (Mean heart rate each point over time - Mean heart rate at beginning);
- = decrease from beginnings; BPM = beats per minute; *after = after the manipulation ended.

Blood Pressure

In this study, blood pressure included systolic blood pressure, diastolic blood pressure, and mean arterial pressure (MAP) obtained from a portable bedside monitor, Nihon Kohden Model Series No.BSM-2301K. Mean systolic blood pressure in the music therapy period displayed a slight decreasing trend from the beginning point to the end of the manipulation, while it almost remained unchanged over time in the control period (see Table 12 and Figure 4). Mean diastolic blood pressure in the music therapy period tended to decline over time, whereas that in the control period did not show a decline pattern over time (see Table 12 and Figure 5). The reduction of mean of MAP in the music therapy period greatly decreased at ten minutes after the music began. On the other hand, the pattern of the mean of MAP at each point of time in the control period was quite stable (see Table 12 and Figure 6).

Table 12. Mean of Blood Pressure Over Time between the Music Therapy Period and the Control Period (N = 20)

Blood pressure over time	Music Therapy Period		Control Period	
	M (mmHg)	SD	M (mmHg)	SD
Systolic blood pressure (mmHg)				
5 mins before beginning	123.65	16.45	122.80	22.10
Beginning	126.45	18.26	123.35	21.42
10 mins	126.55	20.23	124.80	22.21
20 mins	125.55	17.17	124.25	19.91
30 mins	124.65	18.37	124.35	20.44
10 mins after*	124.60	18.33	127.15	20.66
Diastolic blood pressure (mmHg)				
5 mins before beginning	77.95	13.91	74.40	12.96
Beginning	78.35	15.75	73.45	13.88
10 mins	75.35	10.17	73.60	14.13
20 mins	74.40	12.17	72.65	13.95
30 mins	75.40	12.89	74.65	13.00
10 mins after*	75.10	12.22	76.05	12.72
Mean arterial pressure (mmHg)				
5 mins before beginning	92.60	15.37	91.55	15.95
Beginning	98.35	16.10	89.80	16.91
10 mins	90.40	12.65	91.90	16.03
20 mins	91.30	13.91	90.30	16.71
30 mins	95.05	13.65	93.50	17.52
10 mins after*	91.60	12.27	90.20	14.57

Note: *after = after the manipulation ended.

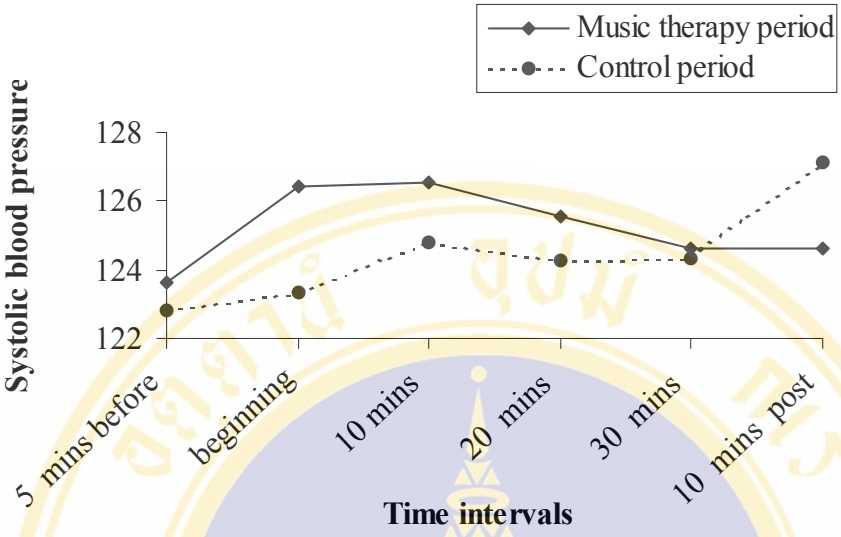

Figure 4. Mean of systolic blood pressure over time

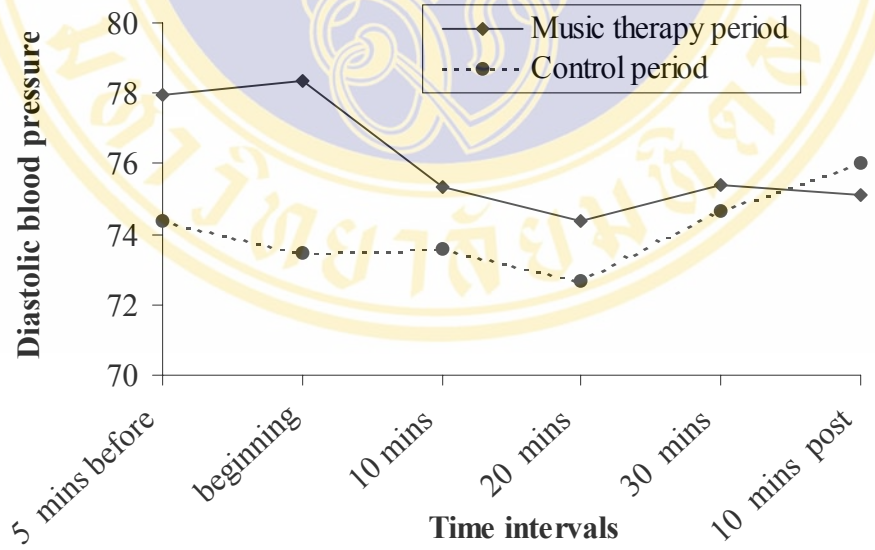

Figure 5. Mean of diastolic blood pressure over time

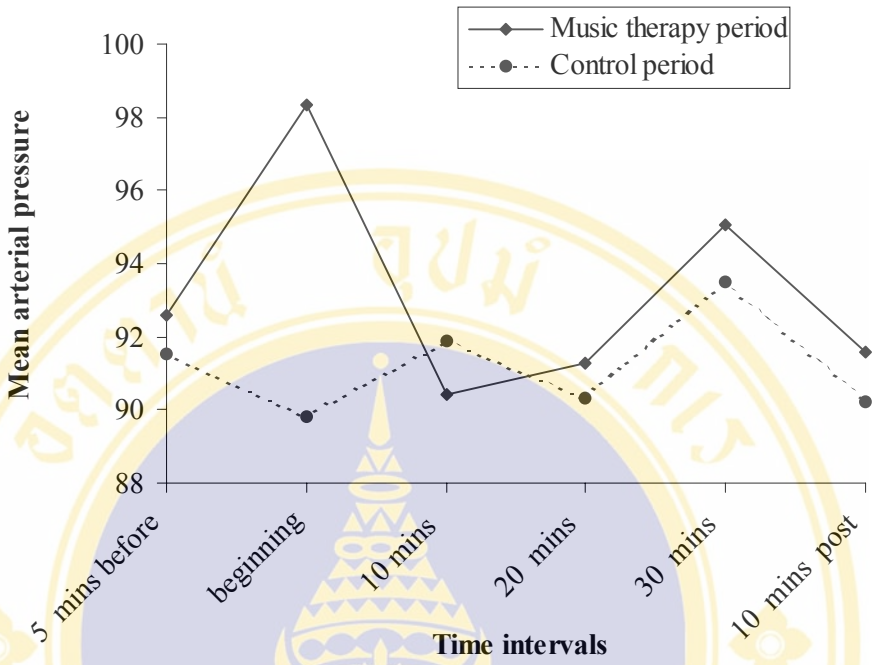

Figure 6. Mean of mean arterial pressure over time

As shown in Table 13, paired t-test was used to detect the significant differences in the mean change of blood pressure of the subjects during the music therapy period and during the control period over time. The results indicated that there were no significant differences in the mean change of systolic blood pressure over time between the two periods ($p > .05$). The mean change of systolic blood pressure of the subjects in the music therapy period ranged from 0.10 to -1.80 mmHg, whereas it ranged from 0.90 to 1.45 mmHg in the control period during the first 30 minutes of the manipulation. At ten minutes after the manipulation ended, the mean change of systolic blood pressure of both periods remained non-significantly different.

Similarly, for diastolic blood pressure, there were no significant differences in the mean change of diastolic blood pressure over time between the two periods ($p > .05$). The mean change of diastolic blood pressure of the subjects in the music therapy period ranged from -2.95 to -3.95 mmHg, whereas it ranged from -0.80 to 1.20 mmHg in the control period during the first 30 minutes of the manipulation. At ten minutes

after the manipulation ended, the mean change of diastolic blood pressure of both periods remained non-significantly different (Table 13).

On the other hand, the mean change of MAP of the subjects in the music therapy period significantly decreased more than that in the control period over time in the first 30 minutes of the manipulation period [t (19) = -2.94, $p < .01$ at ten minutes, t (19) = -2.537, $p < .05$ at 20 minutes, and t (19) = -2.151, $p < .05$ at 30 minutes]. However, at ten minutes after the manipulation ended, the mean change of MAP between the two periods became non-significantly different. The mean change of MAP of subjects in the music therapy period ranged from -3.30 to -7.95 mmHg, whereas it ranged from 0.50 to 3.70 mmHg in the control period during the first 30 minutes of the manipulation (Table 13).

Table 13. A Comparison of the Mean Change of Blood Pressure Over Time between the Music Therapy Period and the Control Period (N = 20)

Blood pressure over time	Music Therapy Period		Control Period		t-value	p-value
	Mean change (mmHg)	SD	Mean change (mmHg)	SD		
Systolic blood pressure						
Beginning-10 mins	0.10	8.89	1.45	6.39	-.665	.514
Beginning-20 mins	-0.90	6.98	0.90	7.78	-.834	.415
Beginning-30 mins	-1.80	11.68	1.00	9.64	-.682	.503
Beginning-10 mins after *	-1.85	10.31	3.80	10.00	-1.484	.154
Diastolic blood pressure						
Beginning-10 mins	-3.00	12.94	0.15	5.82	-.967	.346
Beginning-20 mins	-3.95	13.42	-0.80	6.32	-1.042	.310
Beginning-30 mins	-2.95	14.37	1.20	6.85	-1.160	.260
Beginning-10 mins after *	-3.25	13.13	2.60	7.59	-1.510	.147

Note: Mean change = (Mean blood pressure each point over time - Mean blood pressure at beginning);
- = decrease from beginning; *after = after the manipulation ended.

Table 13. A Comparison of the Mean Change of Blood Pressure Over Time between the Music Therapy Period and the Control Period (N = 20) (continued)

Blood pressure over time	Music Therapy Period		Control Period		t-value	p-value
	Mean change (mmHg)	SD	Mean change (mmHg)	SD		
Mean arterial pressure						
Beginning-10 mins	-7.95	11.40	2.10	5.97	-2.940	.008
Beginning-20 mins	-7.05	12.56	0.50	3.69	-2.537	.020
Beginning-30 mins	-3.30	10.81	3.70	6.05	-2.151	.045
Beginning-10 mins after *	-6.75	13.12	0.40	10.22	-1.757	.095

Note: Mean change = (Mean blood pressure each point over time - Mean blood pressure at beginning); - = decrease from beginning; *after = after the manipulation ended.

Respiratory Rate

Respiratory rate in this study was measured by counting the chest movement in one minute. From Table 14 and Figure 7, the mean of respiratory rate in the music therapy period decreased constantly until at 25 minutes, and then it slightly increased until the manipulation ended. The mean of respiratory rate in the control period also showed a pattern similar that to in the intervention period, but its mean change was less than that in the intervention period.

Table 14. Mean of Respiratory Rate Over Time between the Music Therapy Period and the Control Period (N = 20)

Respiratory rate over time	Music Therapy Period		Control Period	
	M (BPM)	SD	M (BPM)	SD
5 mins before beginning	22.20	3.79	20.10	4.54
Beginning	21.90	3.64	20.35	4.46
5 mins	20.00	3.73	18.90	4.01
10 mins	19.05	3.94	18.65	3.77
15 mins	18.85	3.57	17.80	3.25
20 mins	18.75	3.63	17.90	2.90
25 mins	17.95	3.47	18.60	3.66
30 mins	18.90	4.08	19.50	3.69
5 mins after*	19.05	4.08	18.95	3.94
10 mins after*	20.60	4.92	19.85	4.28

Note: BPM = Breaths per minute; *after = after the manipulation ended.

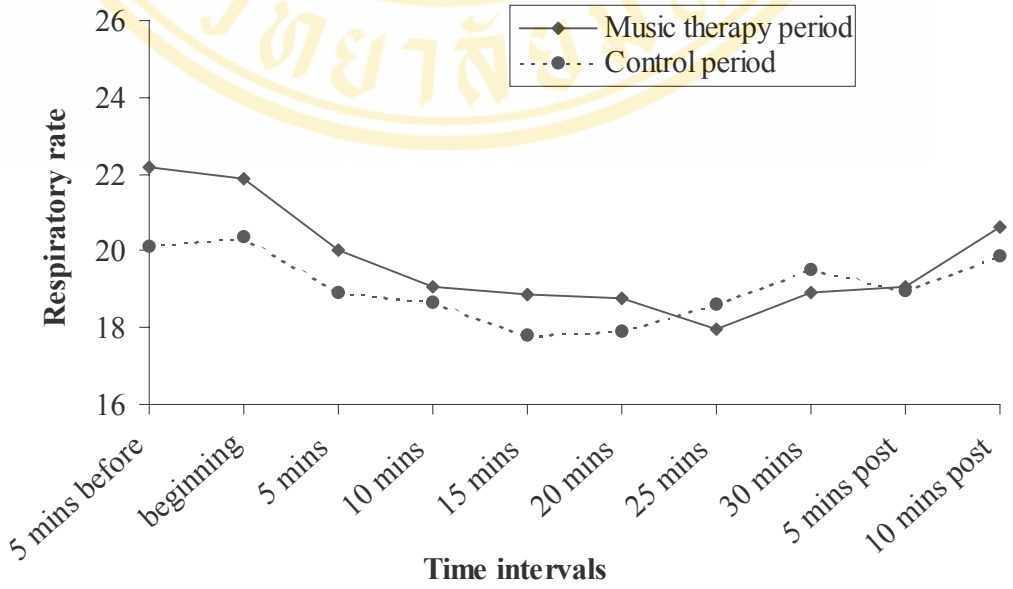

Figure 7. Mean of respiratory rate over time

To examine the effect of music therapy on the respiratory rate of the subjects between the two periods, paired t-test was used. The results indicated that the mean change of respiratory rate of the subjects in the music therapy were significantly decreased than that in the control period at 25 minutes [t (19) = -2.163, p < .05] and at 30 minutes after the manipulation began [t (19) = -2.226, p < .05] as shown in Table 15. The mean change of respiratory rate of the subjects in the music therapy period ranged from -1.90 to -3.95 breaths per minute, whereas it ranged from -0.85 to -2.55 breaths per minute in the control period during the first 30 minutes of the manipulation. However, at five and ten minutes after the manipulation ended, the mean changes of respiratory rate of subjects between the two periods became non-significantly different (Table 15).

Table 15. A Comparison of the Mean Change of Respiratory Rate Over Time between the Music Therapy Period and the Control Period (N = 20)

Respiratory rate over time	Music Therapy Period		Control Period		t-value	p-value
	Mean change (BPM)	SD	Mean change (BPM)	SD		
Beginning-5 mins	-1.90	2.95	-1.45	2.24	-.429	.673
Beginning-10 mins	-2.85	2.58	-1.70	2.58	-1.510	.148
Beginning-15 mins	-3.05	2.37	-2.55	3.46	-.613	.547
Beginning-20 mins	-3.15	2.32	-2.45	3.39	-.796	.436
Beginning-25 mins	-3.95	2.97	-1.75	3.23	-2.163	.044
Beginning-30 mins	-3.00	3.23	-0.85	3.67	-2.226	.038
Beginning-5 mins after *	-2.85	3.34	-1.40	3.12	-1.444	.165
Beginning-10 mins after *	-1.30	3.26	-0.50	2.98	-.799	.434

Note: Mean change = (Mean respiratory rate each point over time - Mean respiratory rate at beginning); - =decrease from beginning; BPM = Breaths per minute; * after = after the manipulation ended.

In conclusion, only two physiologic variables of Hypothesis 2 (the mean change of mean arterial pressure and respiratory rate) in the music therapy period demonstrated a significant reduction as compared to those in the control period. Hence, Hypothesis 2 was only partly accepted.

Hypothesis 3: Weaning parameters (oxygen saturation, tidal volume, and rapid shallow breathing index) are hypothesized separately as follows.

Hypothesis 3.1: Oxygen saturation of patients weaning from mechanical ventilation during the music therapy period increases more than during the uninterrupted rest period without music therapy.

Hypothesis 3.2 Tidal volume of patients weaning from mechanical ventilation during the music therapy period increases more than during the uninterrupted rest period without music therapy.

Hypothesis 3.3 Rapid shallow breathing index of patients weaning from mechanical ventilation during the music therapy period decreases more than during the uninterrupted rest period without music therapy.

Oxygen Saturation

Oxygen saturation refers to arterial oxygen saturation as measured by pulse oximetry (SpO_2), which is frequently used in the critical care unit. In this study, oxygen saturation was measured by a portable bedside monitor of Nihon Kohden Model Series No. BSM 2301K., which was a noninvasive device. From Table 16 and Figure 8, the pattern of mean of oxygen saturation seemed to be flat, meaning that the change was minimal both in the music therapy period and in the control period throughout the manipulation.

Table 16. Mean of Oxygen Saturation Over Time between the Music Therapy Period and the Control Period (N = 20)

Oxygen saturation over time	Music Therapy Period		Control Period	
	M (%)	SD	M (%)	SD
5 mins before beginning	98.05	1.88	98.20	1.96
Beginning	97.95	2.09	98.10	2.05
5 mins	98.10	2.07	97.90	2.53
10 mins	98.10	2.17	98.10	2.40
15 mins	98.25	1.83	98.15	2.39
20 mins	98.20	1.70	98.20	2.09
25 mins	98.10	2.07	98.45	2.19
30 mins	98.20	2.02	98.45	2.09
5 mins after*	98.30	2.05	98.55	1.96
10 mins after*	98.30	2.15	98.40	2.04

Note: *after = after the manipulation ended.

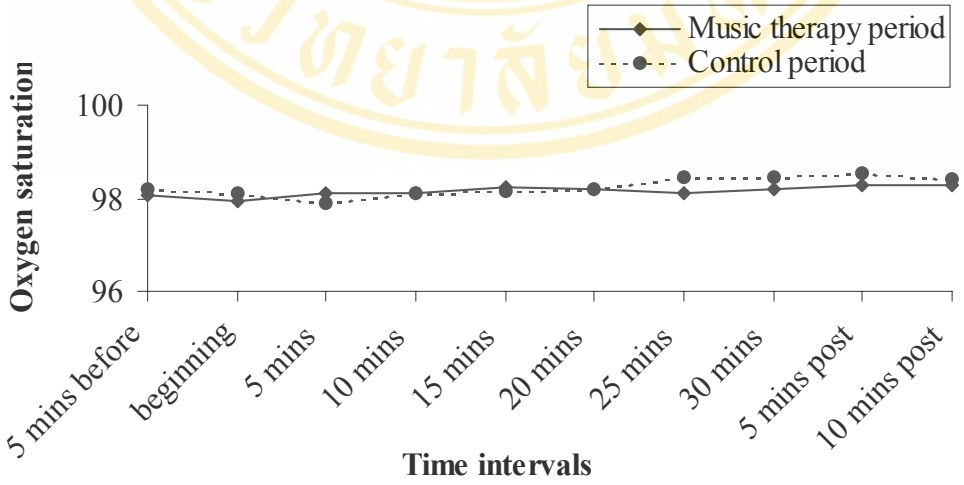

Figure 8. Mean of oxygen saturation over time

InTable 17, pair t-test analysis demonstrated that there were no significant differences in the mean change of oxygen saturation over time between the music therapy period and the control period ($p > .05$). The mean change of oxygen saturation of subjects in the music therapy ranged from 0.15%to 0.30%, whereas it ranged from -0.20% to 0.35 % in the control period during the first 30 minutes of the manipulation.

Table 17. A Comparison of the Mean Change of Oxygen Saturation Over Time between the Music Therapy Period and the Control Period (N = 20)

Oxygen saturation over time	Music Therapy Period		Control Period		t-value	p-value
	Mean change (%)	SD	Mean change (%)	SD		
Beginning-5 mins	0.15	0.67	-0.20	0.95	1.277	.217
Beginning-10 mins	0.15	0.67	0.00	1.12	.497	.625
Beginning-15 mins	0.30	0.92	0.05	0.94	.893	.383
Beginning-20 mins	0.25	1.02	0.10	1.07	.529	.603
Beginning-25 mins	0.15	1.09	0.35	0.93	-.639	.530
Beginning-30 mins	0.25	0.85	0.35	0.81	-.490	.629
Beginning-5 mins after *	0.35	1.04	0.45	0.83	-.370	.716
Beginning-10 mins after *	0.35	1.27	0.30	0.73	.181	.858

Note: Mean change = (Mean oxygen saturation each point over time - Mean oxygen saturation at beginning); - = decrease from beginning; (%) = Percent; *after = after the manipulation ended.

Tidal Volume

Tidal volume is the volume of air exhaled after a normal resting inhalation (Thelan et al., 1998: 649), which was measured by Wright spirometer in this study. As shown in Table 18, the mean scores of tidal volume at the beginning of the manipulation and at the end of the manipulation of the subjects in the music therapy period and in the control period were presented. The increased tidal volume was hypothesized. However, the tidal volume at the end of the manipulation decreased

both in the music therapy period and the control period. The mean change of tidal volume of the subjects in the music therapy period was -17.72 ml., whereas it was -24.12 ml. in the control period at the end of the manipulation. This result indicated that tidal volume of the subjects both in the music therapy period and the control period decreased at the end of the manipulation. However, the analysis using paired t-test showed that there was no significant difference in the mean change of tidal volume between the two periods at the end of the manipulation ($p > .05$).

Table 18. A Comparison of the Mean Change of Tidal Volume between the Music Therapy Period and the Control Period (N = 20)

Manipulation	Before		After		Mean change (After-Before)		t-value	p-value
	M (ml.)	SD	M (ml.)	SD	M (ml.)	SD		
Music	392.97	179.36	375.25	185.02	-17.72	100.22	.259	NS
No music	409.18	185.87	385.06	180.86	-24.12	70.37		

NS = non significant; - = decrease from beginning; ml. = milliliter.

Rapid Shallow Breathing (f/V_T)

Rapid shallow breathing index (f/V_T) is the ratio of respiratory frequency to tidal volume in litres. Currently, rapid shallow breathing index is used widely and regarded as an accurate parameter to predict success in weaning from mechanical ventilation. A literature review shows that rapid shallow breathing index that is less than 105 provides a high opportunity to wean successfully (Sumalee Kredboonsri, B.E. 2545: 319-320).

As shown in Table 19, the mean scores of rapid shallow breathing at the beginning of the manipulation and at the end of the manipulation of the subjects in the music therapy period and in the control period were presented. The decreased value of rapid shallow breathing at the end of the manipulation was hypothesized. However, in this study, the rapid shallow breathing at the end of the manipulation of the subjects both in the music therapy period and the control period increased. The mean change of

rapid shallow breathing of the subjects in the music therapy period was 3.10, whereas it was 5.55 in the control period at the end of the manipulation. When comparing the mean change of rapid shallow breathing at the end of the manipulation between the music therapy period and the control period, the analysis using paired t-test showed that there was no significant difference in the mean change of rapid shallow breathing between the two periods at the end of the manipulation ($p > .05$), as shown in Table 19.

Table 19. A Comparison of the Mean Change of Rapid Shallow Breathing (f/V_T) between the Music Therapy Period and the Control Period (N = 20)

Manipulation	Before		After		Mean change (After-Before)		t-value	p-value
	M	SD	M	SD	M	SD		
Music	70.62	50.14	73.72	50.19	3.10	31.05	-.370	NS
No music	63.69	41.53	69.24	48.00	5.55	14.78		

NS = non significant.

Music Preference

In this study, 20 subjects received both of the two conditions: the music therapy period and the control period. Seventy percent (n = 14) basically liked to listen to music, while six subjects did not liked listening to music. However, all subjects were willing to participate in this study. For the subjects who liked listening to music, the type of music they preferredd is presented in Table 20. Most subjects liked modern Thai songs (35.7%), followed by Thai country music (28.6%), and only one subject basically liked the natural music.

Table 20. Type of Music Preference of Subjects (n = 14)

Type of music preference	Number (n = 14)	Percentage (%)
Modern Thai songs	5	35.7
Thai country music	4	28.6
Music of life	3	21.4
Any type of music	3	21.4
International classical music	2	14.3
Jazz	2	14.3
Natural music	1	7.1
Instrumental	1	7.1
Local folk song	1	7.1

*One subject might report more than one type of musical preference.

The relaxing music that the sample reported was shown in Table 21. Modern Thai song was mostly identified as the relaxation-inducing music (35.7%), followed by music of life (21.4%), and Thai country music (13.3%). Only one subject reported that the natural music helped him feel relaxed.

Table 21. Type of Relaxing Music of Subjects (n = 14)

Type of relaxing music	Number (n = 14)	Percentage (%)
Modern Thai songs	5	35.7
Music of life	3	21.4
Thai country music	2	13.3
Natural music	1	7.1
Local folk songs	1	7.1
Any type of music	1	7.1

*One subject might report more than one type of musical preference.

In addition, close to one third of the subjects liked to listen to music when they had free time(30.8%), followed by those who did so while they were doing their daily activities (23.1%) (Table 22).

Table 22. The Time of Music Listening of Subjects (n = 14)

Time of music listening	Number (n = 14)	Percentage (%)
Free time	4	30.8
Doing daily activities	3	23.1
Being tense/stressed	2	15.4
Being lonely	2	15.4
Being sad	2	15.4
All the time	2	15.4
Enjoy able movement	1	7.7
Doing hobby	1	7.7
Relaxing	1	7.7

*One subject might report more than one time when listening to music.

The usefulness of music therapy during weaning from mechanical ventilation in this study was presented (see Table 23). Most subjects reported the usefulness of music therapy, such as promoting relaxation and comfort (72.2%), followed by reducing anxiety, fear, and suffering (38.9%), and promoting calmness (27.8%). These data were consistent with the hypothesis regarding the effect of music therapy on reducing anxiety and promoting the relaxation response in patients during weaning from mechanical ventilation.

Table 23. The Usefulness of Music Therapy in This Study (N = 20)

Usefulness of music therapy	Number (N = 20)	Percentage (%)
Promote relaxation, and comfort	13	72.2
Reduce anxiety, fear, and suffering	7	38.9
Promote calmness	5	27.8
Promote sentimental and pleasant feeling	4	22.2
Reduce the shortness of breath	3	16.7
Easy to use	2	11.1
Promote sleep	1	5.6
Boost energy	1	5.6

*One subject might give more than one answer.

In addition, the subjects' opinion and comments toward the music were elicited. The four choices of natural music collection in this study which were chosen by the sample included songbirds' sound (n = 10, 50%), followed by the sea sound (n = 8, 40%), and stream sound (n = 2, 10%). Most subjects (n = 17, 85%) reported that the natural music collections used were appropriate in this study. Other types of music, which the subjects suggested for further research, included modern Thai songs, Thai country music, pop music, and traditional Thai songs.

Regarding the duration for listening to music, most subjects (n = 18, 90%) reported that a 30-minute session and twice a day was appropriate. The silent environment would help them relaxed and concentrate better. Regarding the level of satisfaction with the music, which was divided subjectively into three levels: high, moderate, and low, about three-quarters of the subjects (n = 14, 70%) reported moderate satisfaction. In addition, three subjects (15%) reported high satisfaction, while three subjects did not respond to the question.

Summary

This study used an experimental design to test the effect of music therapy on anxiety, physiological responses, and weaning parameters of patients during weaning

from mechanical ventilation. The sample in this study consisted of 20 subjects: eleven Thai males and nine Thai females. Their ages ranged from 22 to 82 years. The respiratory-related problem was the most common cause of current medical diagnosis, while the cardiovascular problem was the most common underlying disease, followed by the respiratory problem. Most subjects were prescribed with the external continuous positive airway pressure (CPAP) weaning method. The common medications that the subjects currently received were bronchodilators, cardiovascular medications, and anticholinesterase agents, respectively. Research hypotheses of the study were tested and the results partly supported the hypotheses. The result of Hypothesis 1 showed that the mean change of anxiety of subjects in the music therapy period significantly decreased more when compared with that in the control period. The results of Hypothesis 2 showed that only the mean change of mean arterial pressure and respiratory rate of subjects in the music therapy period significantly decreased more when compared with those in the control period. Finally, the results of Hypothesis 3 showed the non-significant differences in the mean change of all weaning parameters between the music therapy period and the control period.

CHAPTER V
DISCUSSION

Music therapy was used in this study as a non-pharmacological nursing intervention to reduce anxiety and promote relaxation during weaning from mechanical ventilation. The results of hypothesis testing are reported in Chapter IV. This chapter focuses on discussion of the results, which partly supported the hypotheses.

Hypothesis1: The anxiety level of patients weaning from mechanical ventilation during the music therapy period decreases more than during the uninterrupted rest period without music therapy.

The analysis of Hypothesis 1 demonstrated that the anxiety level of subjects in the music therapy period more significantly decreased when compared with that in the control period. This result was consistent with previous studies regarding the music therapy conducted in the critical care unit (Chlan, 1998; Lueders-Bolwerk, 1990; Pensri Suharitdumrong, B.E., 2537; Puang-Ngern, 2001; White, 1992; Wong, et al., 2001). In this study, the mean change of anxiety score on the Numeric Rating Scale in the music therapy period significantly decreased, while the mean change of the anxiety score in the control period did not show the difference. This result may be explained by the notion of mind-body connection in the holistic model in that there is an intimate and complex interconnection between the mind and the body; physiological and emotional changes are reciprocal (Dossey, 1992: 17). During the weaning period, anxiety, as a psychological distress experience, may occur (Logan & Jenney, 1997: 145-146) because the patient might put effort to reload the respiratory pump (Chao & Scheinhorn, 1998: 804). When anxiety is present, the sympathetic nervous system is stimulated. Physiological distress such as shortness of breathing will occur when the body systems compensate inadequately, which, in turn, induces anxiety. When they perceive more shortness of breathing, they become even more anxious (Grossbach-Landis, 1980: 57-58; MacIntyre, 1995: 278). The experience of shortness of breathing and anxiety during weaning process is a learned response, and then, it may trigger the

anxiety condition and shortness of breathing in the next weaning (McCartney & Boland, 1994: 679). However, for anxious patients, although they have stable physiological conditions, difficulty in breathing and failure to wean can occur (Grossbach-Landis, 1980: 57).

In this study, the effect of music therapy on reducing anxiety can be explained as follows. Music therapy can induce psychological responses through the influence of musical pitch and rhythm on the limbic system, which involves emotion, feelings, and sensation (Guzzetta, 1995: 674). At the limbic system, the impulse of music provides an immediate reward experience through the activation of the brain-reward center, which is concerned with affection, such as a pleasant or unpleasant feeling in the limbic system (Guyton & Hall, 2000: 684; Thaut, 1990, cited in Chlan & Tracy, 1999: 36), resulting in stimulating the release of endorphins. This neurotransmitter will act on specific receptors in the brain to alter emotion and also decrease anxiety (Guzzetta, 2000: 590). In addition, processing of musical sound takes place in the auditory cortex and transmits through the limbic system to the psychoneuroendocrine system of hypothalamic-pituitary-adrenal axis, which stimulates the endorphins to release and decreases anxiety (Wells-Federman et al., 1995: 60).

However, for the assessment of anxiety, the subject might be reluctant to answer the questionnaire candidly because the researcher in this study assessed the anxiety level by herself. Thus, using a research assistant as a data collector might minimize the subjects' reluctance to have the anxiety level assessed. In addition, using the blind technique for the sequence of the manipulation (music/rest or rest/music) in further studies might minimize the bias of the data collector.

Hypothesis2: Physiological responses (heart rate, blood pressure, and respiratory rate) of patients weaning from mechanical ventilation during the music therapy period decrease more than during the uninterrupted rest period without music therapy.

In this study, Hypothesis 2 was only partly supported. The effect of music therapy on physiological responses (heart rate, blood pressure, and respiratory rate) is discussed. Prior to the discussion of the hypothesis testing, the control of confounding factors in this study was discussed first. Heart rate, blood pressure, and respiratory rate are sensitive physiologic responses that may be aroused by various factors (e.g.,

medications, activities, etc.). Although the researcher attempted to make the condition of the sample in the control period and the intervention period equivalent, some factors could not be controlled completely; for example, some patients received multiple medications (e.g., bronchodilators and/or antihypertensive medications) with different schedules or some patients were going to be extubated by the physician within a certain time, which was slightly different from the time set by the researcher during the data collection process. These factors made it difficult to control the exactly equivalent condition between the control period and the intervention period. These confounding factors were of concern; therefore, the equivalent physiologic condition of the subjects between the control period and the intervention period at baseline was further examined.

Using paired t-test, the researcher found that the means of heart rate, systolic blood pressure, diastolic blood pressure, and respiratory rate (except mean arterial pressure-MAP) at baseline between the two periods were not significantly different. This result implies that the medications or any factors that the subjects received with various regimens did not significantly affect heart rate, systolic blood pressure, diastolic blood pressure, and respiratory rate between the two periods at baseline, except the MAP. The MAP between the two periods at baseline was significantly different as the MAP in the music therapy period was significantly higher than that in the control period.

The following section presents the discussion of each variable.

Heart Rate

The analysis in this study revealed that the mean change of heart rate during the music therapy was not significantly different from that during the uninterrupted rest period without music therapy. From Figure 3, the means of heart rate of both the music therapy period and the control period displayed a decline over time until at 25 minutes from the beginning, and then displayed a slightly ascending trend in both periods. The non-significant results were inconsistent with previous studies regarding the music therapy conducted in the critical care unit (Chlan, 1998; Guzzetta, 1989; Puang-Ngern, 2001; White, 1992). In Puang-Ngern's study (2001), the reduction of the mean change of heart rate in the music therapy period was significantly more than that in the control period starting from the 15-minute point to at the end of the

experimental period (at the 30-minute point). However, not all of the previous studies in the critical care unit obtained the significant result of heart rate changes. A number of studies regarding the music therapy conducted in the critical care unit reported a non-significant result of changes in heart rate (Elliott, 1994; Pensri Suharitdumrong, B.E.2537; Zimmerman, et al., 1988).

In this study, the non-significant effect of music therapy on the mean change of heart rate is discussed. Medication is a confounding factor of concern that might have an impact on the heart rate; therefore, the equivalent condition at baseline of the two periods was examined, as previously mentioned. The analysis showed that heart rate in the control period was not significantly different from that in the intervention period at baseline. The possible explanations for the non-significant effect of music on heart rate changes are discussed as follows:

First, heart rate, which is a sensitive variable to arousal in nature, might be simply influenced by activities or rest. The heart rate in this study might be sensitive to rest, which was set in both the control period and the intervention period. In the control period, the subjects rested in the bed with the headphone on, but without music, in the closed curtain. The rest in the control period might produce some degree of relaxation. However, in the intervention period, the music might not reach the therapeutic effect because of some extraneous factors, such as the environmental factors.

Second, the environmental factors, such as noises and temperature, might affect the relaxation response of the patients in either period: the control or intervention periods. A noisy environment may be produced by personnel's talks, telephone calls, bedside monitoring and ventilator alarm, personnel's activities, and so forth. Although the headphone was used in this study, some subjects commented that it could not prevent them from the all noises that disturbed their concentration and relaxation during the music therapy period or the rest period. These noises may minimize the optimal therapeutic effect of music on improving relaxation responses, but it may induce physiological stress, such as increased heart rate or increased peripheral vascular resistance and psychological stress, such as anxiety (Baker, 1992: 75-90). In conclusion, the possible explanations of the non-significant effect of music on heart rate changes are about the rest condition of both periods and the environmental factors.

Lastly, a possible explanation regarding the non-significant effect of music on heart rate is about the presence of ceiling effect. The subjects recruited in this study had to stable hemodynamics, according to the inclusion criteria. Those who had unstable conditions were not eligible to participate in this study. When the subjects with stable hemodynamics received the music therapy, their heart rate might not show much change. It might be possible that the condition of the subjects at baseline reached the ceiling condition that could not be much reduced. According to Polit and Hungler (1995: 502), the ceiling effect tends to reduce the correlation between variables. In brief, music therapy in this study did not significantly reduce heart rate because of a possible reason of the ceiling condition of subject at baseline.

Blood Pressure

Blood pressure presented in this study refers to systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP). The mean change of MAP during the music therapy period was the only variable that significantly decreased over time as compared with that during the control period. From the analysis of the equivalence at baseline of the sample's physiologic conditions, the mean MAP in the intervention period was significantly higher than that in the control period. Although the equivalent conditions at baseline in the two periods were desired, this result should support the hypothesis because it showed that the mean change of MAP in the music period was considerably decreased over time. The mean changes of MAP between the two periods were significantly different at 10, 20, and 30 minutes, but became non-significantly different at ten minutes after the manipulation ended. This result points out that without the music, the mean change of MAP between the two periods became insignificantly different, indicating the effect of music therapy on a reduction of MAP.

The significant effect of music on MAP was consistent with previous studies regarding the music therapy conducted in the critical care unit (Puang-Ngern, 2001; Wong, et al., 2001). In the study, the reduction of mean of MAP in the music therapy period greatly decreased at ten minutes after the music therapy began. On the other hand, the pattern of the mean of MAP at each point of time in the control period was quite stable. The significant result could be explained by the following reason. Blood

pressure is a reflection of circulation of the body. The nervous system almost entirely controls the circulation through the autonomic nervous system, which is capable to changing arterial pressure rapidly. The sympathetic nervous system is a major regulatory part of the circulation. Epinephrine and norepinephrine are the vasoconstrictor hormonal substances, which are impulsed by the sympathetic nervous system. These two hormones are carried in the blood stream to all parts of the body, which act directly on blood vessels and cause vasoconstriction (Guyton & Hall, 2000: 184-188). Music leads to decreased central nervous system arousal, which, in turn, decreases the sympathetic activity. When the release of both epinephrine and norepinephrine in the blood circulation decreases, the total peripheral resistance decreases, and thus, the arterial pressure decreases.

On the other hand, the change in the mean of SBP nor DBP between the two periods were not significantly different over time. The mean SBP in the music therapy period displayed a slightly decreasing trend from the beginning point to the end of the manipulation, while it was almost the same over time in the control period. However, the changes of the mean SBP were not significantly different between the two periods. The non-significant effect of music therapy on SBP was similar to pervious studies regarding the music therapy conducted in the critical care unit (Barnason, et al., 1995; Elliott, 1994; Zimmerman, et al., 1988).

Similarly, the mean changes of DBP between the two periods were not significantly different. A number of studies reported the non-significant effect of music on DBP (Barnason, et al., 1995; Elliott, 1994; Puang-Ngern, 2001; Zimmerman, et al., 1988). The inconsistent results in this study (the significant effect of music on MAP, but not on both SBP and DBP) raised a question. This result might be explained by the notion that SBP and DBP might not offer sufficient precision in detecting changes from biobehavioral interventions, such as the music therapy intervention. Possible explanations of the different results of the effect of music therapy on MAP and on SBP or DBP are discussed.

Theoretically, blood pressure is arterial pressure, which originates from ventricles. Systolic pressure is the highest blood pressure when the heart is pumping, while diastolic pressure is the lowest blood pressure when the heart is relaxing. Mean arterial pressure (MAP) is the average of arterial pressure (Vattana Vattanapa, B.E.

2544: 392). When the heart contracts and blood passes to the part of body organs, it induces pressure wave. The pressure wave is arterial pressure, which originates from ventricles. While the pressure wave travels from aorta to smaller arteries, its shape and size will vary depending upon the vessel size; for example, in the large artery, systolic blood pressure will increase and diastolic blood pressure will decrease. For MAP, although the shape of pressure wave changes, the MAP continues to decrease from aorta through arteries and arterioles. Because MAP is a drive of blood circulation, it does not directly drive systolic or diastolic pressure. The drive of MAP will decrease when blood flows through the resistance of vessels, according to the rule of Ohm. Thus, the value of systolic and diastolic blood pressure may vary more than the MAP when blood flows through vessels (Vattana Vattanapa, B.E. 2544: 392-393).

In addition, the method of blood pressure measurement is an important notion. In this study, blood pressure was obtained from a portable bedside monitor, Nihon Kohden model series No. BSM-2301K. This measurement method is an oscillometry method, which was invented by Etienne J. Marey in 1875. The oscillometry method is a foundation of the autonomic measuring instrument at present, which uses the principle of vibration detection. The MAP is the point that the vibrating force is strongest. The error value of MAP of this method are about ± 10 mmHg. By the oscillometry method, the definition of systolic blood pressure and diastolic blood pressure are problematic. Systolic blood pressure is defined as the vibrating force that increases rapidly, while diastolic blood pressure is defined as the vibrating force that decreases rapidly. From this notion, in the patient with shock, MAP by the oscillometry method is the most reliable indicator of blood pressure measurement because it detects the strongest vibrating point (Charn Kredboonsri, B.E. 2545: 149-150). In conclusion, the non- significant effect of music on SBP and DBP might be due to the sensitivity of the measuring parameter and the measurement method.

Respiratory Rate

The mean change of respiratory rate of the subjects in the music therapy period demonstrated a more significant reduction when compared with that in the control period across the 30-minute intervention period. The mean respiratory rates in the music therapy period constantly decreased from baseline until at 25 minutes before

slightly increasing until the manipulation ended. The significant differences of the mean change of respiratory rate between the two periods were found only at 25 minutes and 30 minutes during the manipulation period, and it then became non-significant after the manipulation ended at 5 and 10 minutes. The mean respiratory rate in the control period showed a pattern similar to that in the intervention period, but its mean change decreased less than that in the intervention period. The significant effect of music on the respiratory rate was consistent with previous studies regarding the music therapy conducted in the critical care unit (Chlan, 1998: Puang-Ngern, 2001: White, 1992). In Puang-Ngern's study (2001), the result showed that the reduction of respiratory rate of the subjects in the music therapy period was significantly more than that in the control period, starting from at the 15-minute point to at the end of the experimental period (at the 30-minute point). The significant result regarding the respiratory rate supported Hypothesis 2 in that music therapy can promote relaxation responses, as indicated by a reduction of the mean change of respiration rate of the subjects in the music therapy period when compared with that in the control period.

As for Hypothesis 2, the reduction of the mean change of MAP and respiratory rate in this study may be explained by the relaxation responses to music therapy. In this study, music therapy is proposed as a complementary intervention to help patients during weaning from mechanical ventilation. When musical sound falls in the ears, the neuronal coding of music along with the auditory neural pathways passes to the auditory cortex (Guyton, 1986: 740-741). Music therapy induces psychophysiologic relaxation responses by integrating functions of the limbic-hypothalamic system that leads to a generalized decrease in central nervous system arousal (Wells-Federman et al., 1995: 61). Signals from the hypothalamus and the cerebrum are transmited to autonomic control centers of the brain stem, which, in turn, decrease sympathetic nervous system activities. The secretion of epinephrine and norepinephrine decreases in the blood circulation, resulting in lower blood pressure and respiratory rate (Guyton & Hall, 2000: 697-708; Wells-Federman et al., 1995: 60-61).

Regarding the carryover effect of the music therapy, the data in this study demonstrated that the carryover effect of this music therapy on the reduction of MAP and respiratory was short. The mean changes of MAP between the two periods were significantly different at 10, 20, and 30 minutes, but became non-significantly

different at 10 minutes after the manipulation ended. Similarly, the differences of the mean change of the respiratory rate between the two periods were found to be significant only at 25 minutes and 30 minutes in the manipulation period, but it became non-significant at 5 and 10-minute after the manipulation ended. These results showed that without the music, the mean change of MAP or respiratory rate between the two periods became non-significantly different, indicating that the carryover effect of music therapy on a reduction of MAP and respiratory rate lasts a short duration. This finding may be useful for a researcher to design the methodology of further studies regarding music therapy.

Hypothesis 3: Weaning parameters (Oxygen saturation, Tidal volume, and Rapid shallow breathing index)

The results regarding the effect of music therapy on weaning parameters did not support Hypothesis 3 and are discussed as follows. The analysis of Hypothesis 3 revealed that all weaning parameters between the two periods were not significantly different. The non-significant effect of music on oxygen saturation in this study was consistent with previous study. For instance, Dubois, et al. (1995) found that there was no significant difference in oxygen saturation between patients who underwent bronchoscopy in the music group and those in the control group. However, the non-significant effect of music on oxygen saturation in this study was inconsistent with previous studies regarding the music therapy conducted in the critical care unit (e.g., Burke, et al., 1995; Puang-Ngern, 2001). A reason for the different results regarding oxygen saturation between this study and previous studies is that the sample in this study was patients during weaning from mechanical ventilation, while that in previous studies was those who had mechanical ventilation. Basically, mechanical ventilation preserves and/or increases the functional capacity of respiratory muscles. The subjects in this study were in the period of weaning, during which, the patients must put effort to breathe by themselves. Thus, the respiratory muscles required more oxygen and the oxygen requirement might increase if there are an increase in rapid breathing, tissue resistance, and airway resistance (Stone, 1996: 571).

Fatigue and weakness of respiratory muscles may occur during weaning, which can be caused by several factors such as an asynchronous breathing pattern, abdominal distension, phrenic palsy, or poor nutritional status (Wilson, 1996: 696). Most subjects

in this study received weaning prescription as tolerate; therefore, fatigue and weakness of respiratory muscle might occur in both control and intervention periods. In addition, during the weaning period, anxiety might be present because the subjects must put effort to reload the respiratory pump (Chao & Scheinhorn, 1998: 804). When the sympathetic nervous system is stimulated, physiological distress can result, including bronchoconstriction and increased muscle tension. This may result in increasing airway resistance, work of breathing, and oxygen demand (Grossbach-Landis, 1980: 57-58) in both control and intervention periods. Thus, these factors may lead to the non-significant effect of music on oxygen saturation, tidal volume, and rapid shallow breathing index. The different conditions of the sample (with-and-without mechanical ventilation) might be a possible explanation for the different effects of music therapy.

Another possible explanation is that some subjects fell asleep during the manipulation period. It might be possible that the tidal volume after the manipulation ended was lower than that before the manipulation, and then, rapid shallow breathing index was increased. This did not support the hypothesis. However, the patients who fell asleep either during the intervention period or the control period were not identified by the data in the study.

Although the number of studies examining the effect of music therapy in the critical care unit has increased, no study regarding the effect of music therapy on weaning parameters in patients during weaning from mechanical ventilation was found in the literature. In summary, the findings of this study were similar to those in a systematic review regarding the effectiveness of music as an intervention for hospital patients (Evans, 2002). The results of this meta-analysis demonstrated that music effectively reduces anxiety and produces a small decrease in respiratory rate for hospital patients, but it appears that music has no impact on the heart rate and systolic blood pressure for hospital patients (Evans, 2002; 10-16).

Study Limitations

This section presents the study limitations. The study limitations were not overlooked because they might interfere with the outcome variables. The limitations in this study included: (1) medications received; (2) psychophysiological readiness of the

sample; and (3) the small sample size. Although these issues were previously considered in this study, some factors could rarely be controlled in the real settings.

Firstly, the medications that the subjects received might affect the physiologic and weaning variables. These medications were recorded for all patients during the study. The medications used in this study were divided into three groups including bronchodilators, cardiovascular drugs, and anticholinesterase drugs. About three-fourths of the subjects (70%) took these medications. Although the investigator tried to control the equivalent conditions regarding the medications received (e.g., the time interval after receiving the medication, the time schedule for starting the experiment, and the kind of medications used) of both the music and control periods, it was not exactly the same. For example, some subjects took more than one kind of bronchodilators and/or cardiovascular drugs around the experiment. However, the manipulation of this study was carefully scheduled, based on the action of medications, particularly on the peak action of medications used. Because this factor was of concern, a further analysis was conducted to examine the differences in physiologic measures and weaning parameters at baseline between the two periods (music therapy and control periods). Using paired t-test, the analysis revealed that physiologic measures and weaning parameters of the subjects at baseline between the two periods were not significantly different.

In addition, a further analysis was made to examine the differences in physiologic measures and weaning parameters at baseline between the two groups: the subjects who received the aforementioned medications and those who did not. Using independent t-test, the researcher found a non-significant difference in physiologic measures and weaning parameters between the two groups at baseline. These results may imply that the medications used in this study, regardless of the time interval and the kind or number of medications received, were not significantly associated with the physiologic measures and weaning parameters of the subjects neither in the two periods of the same subjects nor in the two groups (receiving or not receiving the medications). However, the effect of medications beyond the baseline is not yet known; therefore, further studies should find ways to minimize extraneous variables from medications as much as possible.

Secondly, the psychophysiological readiness of the sample for music therapy poses a limitation in the study. After the manipulation ended in this study, the subjects commented that their relaxation was disturbed by several factors in the critical care unit such as dyspnea, fatigue, pain and discomfort related to endotracheal intubation, the voiceless condition, and so forth. Some subjects stated that, *"I felt bad with my condition. My mind was not clear. Thus, this music was not fully effective to help me relaxed."* In addition, the subjects reported that if they were in a more favorable condition, they thought that music therapy would help them relaxed more. Readiness of psychophysiological conditions to listen to music may influence the optimal therapeutic effect of music therapy because "the therapeutic effect of music decreases when the listener is angry, distracted, critical, analytic, and resistant"(Guzzetta, 1995: 681).

Lastly, the small sample size in this study was considered a limitation of the study. The sample size of this study was 20 subjects, which yielded 40 cases of data, according to the crossover design. According to power analysis (Cohen, 1988: 54), with a power of .80, the medium effect size of 0.5, a one-tailed test, and the alpha level of .05, a sample of 50 was required in this study. Indeed, the effect size of music therapy on the outcome variable for this study is unknown. However, it was difficult to obtain the sample size based on the power analysis in this study because of multiple factors. For instance, in many cases, the weaning process was operated in a short time and an extubation was done before the experiment finished. In addition, some patients who met the inclusion criteria refused to participate in the study. Also, the number of patients who were ready to wean from mechanical ventilation was difficult to find within a limited duration. These reasons resulted in many missing cases. However, the sample size in this study, according to Polit and Hungler (1987: 220), may assure an acceptable number of the sample. Because increasing the sample size will increase the power of test and decrease the risk of committing a type II error (Polit & Sherman, 1990: 365), the next study should recruit a larger sample size to obtain an adequate power to find significance.

In addition to the study limitations, a suggestion is addressed. Individual musical preference should be considered because it may influence the outcome variables. The self-selected music of the subjects in previous studies (Chlan, 1998; Guzzetta; 1989;

Wong, et al., 2001) demonstrated the effectiveness of music therapy on reducing anxiety and promoting relaxation response. In this study, the subjects selected the music from four choices by themselves (i.e., songbird sounds, stream sounds, sea sounds, or wind sounds). From an open-ended question, it was learned that only one subject liked the natural music. The rest of them liked other types of music that had lyrics, such as modern Thai songs, Thai country music, music of life, and so forth. They felt relaxed with these types of music. Theoretically, a number of researchers (Cook, 1981: 261; Guzzetta, 1995: 679) state that music without words is preferable because the listener can concentrate on the flow of music so that they are not influenced by culture, tradition, and language through words and their meanings. However, the effect of music with words that the listener prefers is not yet examined. In addition, the rhythm of music beats should be considered in promoting relaxation. Researchers who studied music therapy (Cook, 1981: 259; Thaut et al, 1999: 107) have suggested that music with 70-80 beats per minute is appropriate to be soothing music, while the faster beats may increase tension. Further studies should consider various types of music to serve the individual preferences and find the rhythm suitable to promote the relaxation response.

In summary, music therapy as a nursing intervention is effective in reducing anxiety and promoting relaxation. The findings of the study indicate that the anxiety level, mean arterial pressure, and respiratory rate of subjects in the music therapy period more significantly decreased when compared with those in the control period. However, the study limitations that have might interfered with the outcome variables include: (1) medications received, (2) psychophysiological readiness of the sample, and (3) the small sample size. The implications of the findings of the study for clinical practice were that music therapy should be used in the patients during weaning from mechanical ventilation based on the individual musical preferences because music can reduce anxiety and promote relaxation. These outcomes would help the patients to conserve their energy, which, in turn, promotes their healing and recovery.

CHAPTER VI
CONCLUSIONS

Conclusions

This study aimed to test the effect of music therapy on anxiety, physiological responses, and weaning parameters in patients during weaning from mechanical ventilation between the two periods: receiving music therapy and receiving uninterrupted rest without music therapy. The sample in this study was recruited by means of purposive sampling and consisted of 20 patients during weaning from mechanical ventilation in three settings at the Intermediate Care Unit, the Intensive Care Unit, and the Coronary Care Unit at Ramathibodi Hospital, Bangkok, Thailand from July 2002 to February 2003.

The instruments used in this study included experimental instruments and data collection instruments. The experimental instruments included a portable compact disk player with headphones, compact disks of the natural music collection, a portable bedside monitor (Nihon Kohden Model Series No. BSM 2301K, which was a noninvasive, automatic device), and Wright spirometer. The data collection instruments included the Demographic Data Questionnaire, the Clinical Data Record, the Personal Musical Preference Questionnaire, the Numeric Rating Scale of Anxiety Measurement, the Physiological and Weaning Parameters Record, and the Questionnaire of Satisfaction with Music Therapy.

A crossover experimental design was used in this study, in which each subject served as their own control. Each subject was exposed to both the intervention period and the control period. The time interval between the two periods was at least three hours on the same day. The sequence of being in the different conditions (music/rest or rest/music) was randomly assigned by drawing lots. In the intervention period, all subjects received a chance to select natural music from four choices of the natural music collection. The subjects listened to the chosen music through headphones with a compact disk player for 30 minutes. In the control period, all procedures were the same as those in the intervention period, but it was no music through the headphones.

Twenty patients during weaning from mechanical ventilation were purposively selected for the study according to the inclusion criteria previously designed. The sample consisted of eleven males and nine females. Their ages ranged from 22 to 82 years (M = 49.70 years; SD = 19.39). Half of the subjects had current respiratory-related medical diagnoses.

Data were analyzed by using the paired t-test. The results of this study are as follows:

1. A comparison of the change in the mean anxiety scores of the subjects between the music therapy period and the control period showed a more significant decrease in the subjects during the music therapy period than that during the control period [$t(19) = -3.102$, $p < .01$].

2. A comparison of the changes in the mean heart rates over time between the music therapy period and the control period revealed a non-significant difference between the two periods over time ($p > .05$).

3. A comparison of the changes in the means of systolic blood pressure, diastolic blood pressure, and mean arterial pressure over time between the music therapy period and the control period indicated a non-significant difference in the mean change of systolic blood pressure nor diastolic blood pressure between the two periods over time ($p > .05$). However, the mean change of mean arterial pressure of the subjects during the music therapy period decreased more significantly than that during the control period throughout the first 30 minutes of the manipulation period: at 10 minutes [$t(19) = -2.94$, $p < .01$], at 20 minutes [$t(19) = -2.537$, $p < .05$], and at 30 minutes [$t(19) = -2.151$, $p < .05$]. However, at 10 minutes after the music ended, the mean changes of mean arterial pressure between the two periods became non-significantly different.

4. A comparison of the changes in the mean respiratory rate over time between the music therapy period and the control period revealed a more significant decrease in the subjects during the music therapy period than that during the control period at 25 minutes [$t(19) = -2.163$, $p < .05$] and at 30 minutes after the manipulation began [$t(19) = -2.226$, $p < .05$]. However, at 5 minutes and 10 minutes after the music ended, the changes in the mean respiratory rate between the two periods became non-significantly different.

5. A comparison of the changes in the mean oxygen saturation over time between the music therapy period and the control period showed a non-significant difference between the two periods over time ($p > .05$).

6. A comparison of the change in the mean tidal volume of the subjects between the music therapy period and the control period indicated a non-significant difference between the two periods ($p > .05$).

7. A comparison of the change in the mean rapid shallow breathing index (f/V_T) of the subjects between the music therapy period and the control period showed a non-significant difference between the two periods ($p > .05$).

In conclusion, this study demonstrated that music therapy could reduce anxiety, respiratory rate, and mean arterial pressure in patients during weaning from mechanical ventilation.

Recommendation for Nursing Practice

The findings from this study demonstrated the usefulness of music therapy as a nursing intervention to reduce anxiety and promote relaxation in patients during weaning from mechanical ventilation. However, before using music therapy, the patients' readiness for music should be assessed. Based on the results in this study, a 30-minute duration of music is appropriate to promote relaxation response, as indicated by the decreased anxiety level, mean arterial pressure, and respiratory rate. Using headphones during listening to the music should be useful to prevent the surrounding noises from disturbing the patients. However, the headphones may be optional for patients who are not comfortable with them.

Recommendations for Further Research

The results from this study demonstrated that a 30-minute session of music therapy may be an adequate period of time to induce relaxation response in patients during weaning from mechanical ventilation. The usefulness of music therapy should be tested in other samples in the critical care unit such as patients with the difficult-to-wean condition, those with sleep disturbance, and those during the rehabilitation. The patients may perceive these situations as stressful events that may induce anxiety.

Therefore, music therapy should be tested as a complementary intervention to promote relaxation and reduce anxiety.

The natural sounds in this study were found to be the effectiveness in reducing anxiety and promoting relaxation in patients during weaning from mechanical ventilation. However, data from the Personal Musical Preference Questionnaire showed that the subjects in this study preferred various types of music, such as modern Thai songs, Thai country music, and others. Also, the effect of music with words that the listeners prefer was not examined in the present study. Therefore, it is suggested that the patients' musical preferences are taken into account in future studies because individual musical preference may influence the outcome variables. In addition, the rhythm of music beats should be considered in promoting relaxation. A number of authors (Cook, 1981: 259; Thaut et al., 1999: 107) suggested that the rhythm of 70-80 beats per minutes be appropriate for music therapy.

Finally, the result of this study showed that the carryover effect of music does not last long in producing relaxation responses (e.g., mean of arterial pressure and respiratory rate). The time interval between the two periods was set for at least three hours in this study, resulting in a high attrition rate. In designing the next study, the time interval between the control period and the intervention period (if the crossover design is used) should be shorter.

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APENDIX A

Information Sheet

My name is Jiraporn Chontichachalalauk. I am a graduate student in adult nursing, Ramathibodi School of Nursing, Faculty of Medicine, Ramathibodi Hospital, Mahidol University. I am studying the effect of music therapy on the anxiety level, physiological responses, and weaning parameters in patients during weaning from mechanical ventilation. You are invited to participate in the study. You may accept or decline. If you agree to participate in the study, you will be interviewed personally regarding your music preferences and you will be asked to select one choice from a natural music collection you prefer to use during the music intervention period. The study process will be divided into two periods: the intervention period (receiving a 30-minute music therapy period) and the control period (receiving a 30-minute uninterrupted rest without music) on the same day. You will draw the lots of the sequence of the conditions (music/rest or rest/music) by yourself. During the music therapy period, you will listen to the music that you have chosen through headphones played by a portable compact disk player for 30 minutes continuously. You may control the music volume by yourselves. Heart rate, blood pressure, and oxygen saturation will be measured periodically for 30 minutes by an autonomic portable monitor. Besides, you will be asked about your anxiety level before and after the manipulation. During the uninterrupted rest period, you will use the headphones to avoid surrounding noises. All data will be kept strictly confidential and presented as group data. You have the rights to refuse to participate in the study without affecting the relationship with the personnel or the treatment you receive in the hospital. You still receive services from the hospital unit as usual. In adition, you have the right to withdraw your participate at any time during the study.

Thank you for your participation.

Jiraporn Chontichachalalauk

เอกสารชี้แจงข้อมูล/คำแนะนำแก่ผู้เข้าร่วมงานวิจัย

สวัสดีค่ะดิฉันนางสาวจิราพร ชลธิชาชลาลักษณ์ นักศึกษาพยาบาลปริญญาโท สาขาการพยาบาลผู้ใหญ่ โรงเรียนพยาบาลรามาธิบดี คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล ดิฉันกำลังศึกษาเกี่ยวกับผลของดนตรีบำบัดต่อความวิตกกังวลและการตอบสนองทางด้านร่างกายในผู้ป่วยที่หย่าจากเครื่องช่วยหายใจ เพื่อนำความรู้ที่ได้มาเป็นแนวทางในการดูแลผู้ป่วยต่อไป จึงใคร่ขอเชิญท่านเข้าร่วมการวิจัยในครั้งนี้ ท่านมีสิทธิที่จะเข้าร่วมหรือปฏิเสธได้ ถ้าท่านยินดีเข้าร่วมในการวิจัย ท่านจะได้เลือกชนิดของเสียงธรรมชาติหนึ่งเสียงเพื่อใช้ฟังในช่วงดนตรีบำบัด การวิจัยจะทำในช่วงที่ท่านหย่าจากเครื่องช่วยหายใจ แบ่งเป็น 2 ช่วง ภายใน 1 วัน ลำดับก่อนหรือหลังแล้วแต่การจับฉลากของท่านเอง ในช่วงดนตรีบำบัด ท่านจะได้รับฟังดนตรีเสียงธรรมชาติที่ได้เลือกไว้ ผ่านทางหูฟังของเครื่องเล่นแผ่นเสียงแบบพกพา สามารถปรับเสียงได้เองเป็นเวลา 30 นาที โดยจัดสิ่งแวดล้อมให้เงียบสงบ ได้รับการวัดชีพจร ความดันโลหิตและ ความอิ่มตัวของออกซิเจนในเลือดแดงอย่างต่อเนื่องจากเครื่องวัดชีพจรและความดันโลหิตอัตโนมัติโดยผู้วิจัยจนสิ้นสุดการวิจัย ส่วนในช่วงพักผ่อน ท่านจะได้รับทุกอย่างเหมือนช่วงดนตรีบำบัดแต่ไม่มีเสียงดนตรีผ่านทางหูฟัง นอกจากนี้ท่านจะได้รับการสอบถามเกี่ยวกับแบบวัดความวิตกกังวลก่อนและหลังการทำวิจัย รวมทั้งข้อมูลเกี่ยวกับการฟังดนตรีของท่านเอง ข้อมูลของท่านทั้งหมดจะเก็บเป็นความลับและจะนำเสนอในภาพรวมของตัวอย่างประชากรเท่านั้น ท่านมีสิทธิที่จะปฏิเสธเข้าร่วมการวิจัยโดยไม่มีผลกระทบต่อสัมพันธภาพของเจ้าหน้าที่ของโรงพยาบาลและยังได้รับการพยาบาลทุกอย่างตามปกติ และท่านมีสิทธิถอนตัวจากการวิจัยได้เมื่อท่านต้องการ

ขอขอบคุณในการเข้าร่วมการวิจัย

(นางสาวจิราพร ชลธิชาชลาลักษณ์)

นักศึกษาพยาบาลศาสตรมหาบัณฑิต

APENDIX B

PART I

Demographic Data Questionnaire

Ward. □ 7NW □ ICU □ CCU No….

1. Sex
   - □ Male □ Female
2. Age …….years old.
3. Ethnicity
   - □ Thai □ Others …….
4. Religion
   - □ Buddhism □ Christianity
   - □ Muslim □ Others …….
5. Educational level
   - □ No formal education □ Elementary school
   - □ Middle school ☑ High school
   - □ Post high school □ College and higher
6. Marital Status.
   - □ Single □ Married
   - □ Widowed/Divorced
7. Occupation
   - □ Unemployed/Retired
   - □ Employee
     - □ Government official /State enterprise employee
     - □ Self-employed
     - □ Others (please specify ……)

Part I. Demographic Data Questionnaire (continued)

8. Monthly family income.

□ < 5000 Baht □ 5,001-10,000 Baht

□ 10,001-15,000 Baht □ 15,001-20,000 Baht

□ 20,001-25,000 Baht □ > 25,000 Baht

9. Method of payment of hospital charge

□ Paid by self

□ Reimbursement from the government welfare scheme

□ Universal coverage scheme

□ Social security scheme

□ Others (please specify…….)

PART II

Clinical Data Record

1. Current medical diagnosis ……
2. Underlying disease ……..……..
3. Length of hospital stay ……days
4. Length of using mechanical ventilation ……days
5. Duration of weaning on T-piece trial, external continuous positive airway pressure (CPAP), or CPAP mode with pressure support of ventilator ……. days
6. Type of intubated artificial airway
   Number of tube……
   □ Nasal endotracheal tube □ Oral endotracheal tube □ Tracheostomy
7. Type of the weaning method
   □ T-piece trial □ External continuous positive airway pressure (CPAP)
   □ CPAP mode of ventilator □ Pressure support of ventilator
8. Wean prescription……
9. Experience with weaning from mechanical ventilation
   □ Yes □ No
10. Experience with admission in the critical care unit
    □ Yes □ No
11. Current medication use
    □ Yes □ No
    If yes, specify name/route/dosage
    □ Bronchodilator ……...…
    □ Cardiovascular drug…..……...……..
    □ Sedative drug…….
    □ Others (specify)……..……..
12. Previous use of the relaxation technique when stressful……

PART III

Personal Musical Preference Questionnaire

1. Do you like listening to music?.

   ☐ Yes ☐ No

2. What type of music do you like? (There can be more than one answer.)

   ☐ Jazz ☐ Local folk songs
   ☐ Classic ☐ Natural music
   ☐ Pop ☐ Thai country music
   ☐ Rock ☐ Tradition Thai songs
   ☐ Others …….

3. What type of music helps you to relax? (There can be more than one answer.)

   ☐ Jazz ☐ Local folk songs
   ☐ Classic ☐ Natural music
   ☐ Pop ☐ Thai country music
   ☐ Rock ☐ Tradition Thai songs
   ☐ Others …….

4. How frequently do you listen to music?

   ☐ Not at all ☐ Seldom
   ☐ Sometimes ☐ Often
   ☐ Always

   Please specify …….

5. When do you like to listen to music ? (There can be more than one answer.)

   ☐ Being anxious ☐ Enjoy able movement
   ☐ Being tense ☐ Exercising
   ☐ Being lonely ☐ Doing hobby
   ☐ Being sad ☐ Relaxing
   ☐ Others……..

6. What type of natural sounds do you like the most?

   ☐ Wind ☐ Stream
   ☐ Sea ☐ Songbirds

PART IV

□□

__/__/__

The Numeric Rating Scale (NRS) of Anxiety Measurement

This scale represents your overall perception of anxiety level. Please mark (x) the most appropriate number to the right of the anxiety level to indicate how you feel right now. The scores range on a 10-point scale from 0 to 10 (0 = no anxiety and 10 = as much anxiety as one could possibly have).

Anxiety level

0 1 2 3 4 5 6 7 8 9 10

no anxiety **as much anxiety as one could possibly have**

The Numeric Rating Scale (NRS) of Anxiety Measurement

This scale represents your overall perception of anxiety level. Please mark (x) the most appropriate number to the right of the anxiety level to indicate how you feel right now. The scores range on a 10-point scale from 0 to 10 (0 = no anxiety and 10 = as much anxiety as one could possibly have).

Anxiety level

0 1 2 3 4 5 6 7 8 9 10

no anxiety **as much anxiety as one could possibly have**

PART V

□□

Physiological and Weaning Parameters Records

The sequence are music/rest or rest/music

□ Music □ No music

Date ……

Time ……

Variables	Before manipulation	After manipulation
1. Tidal volume (ml) 2. Rapid Shallow Breathing Index (fx/Vt)		

Variables	Time (Minutes)									
	5 mins before beginning	Beginning Point	5	10	15	20	25	30	5 mins after	10 mins after
1. Heart rate										
2. Blood pressure			-		-		-		-	
3. Mean arterial pressure			-		-		-		-	
4. Respiratory rate										
5.Oxygen saturation										

Note. Blood pressure will be measured at 5 minutes before beginning, beginning point, and then every 10 minutes for six times in total.

PART VI

The Questionnaire of Satisfaction with Music Therapy

1. Do you think that the music therapy helps you to feel relaxed during weaning from mechanical ventilation?

   □ Yes □ No

   If yes, please specify (There can be more than one answer.)

   □ reduce anxiety, fear, and suffering
   □ promote relaxation □ easy to use
   □ promote calm □ economical
   □ reduce the shortness of breath
   □ others …….

2. Is the 30-minute period of listening to music appropriate?

   □ Yes □ No

   If no, do you think how long it should last?

   □ 15-20 minutes □ 25-30 minutes
   □ 30-45 minutes □ 1 hour
   □ others …….

   How often should there be a music therapy session per day during hospitalization?

   □ once day □ three times a day
   □ twice a day □ others……..

3. Is the type of music in this study appropriate?

   □ Yes □ No

   If no, please suggest the type of music you would like to have…….

5. How satisfied are you with this music therapy?

   □ Not at all □ A little
   □ Moderately □ Very

6. Comments

   ……..……..

   ……..……..

ส่วนที่1

ข้อมูลทั่วไป

หอผู้ป่วย ☐ 7NW ☐ ICU ☐ CCU ลำดับที่.....

1. เพศ

   ☐ ชาย ☐ หญิง

2. อายุ.....ปี

3. เชื้อชาติ

   ☐ ไทย ☐ อื่นๆ

4. ศาสนา

   ☐ พุทธ ☐ คริสต์

   ☐ อิสลาม ☐ อื่นๆ

5. การศึกษา

   ☐ ไม่ได้รับการศึกษาในระบบ ☐ ป.1-ป.6

   ☐ ม.1-ม.3 ☐ ม.3-ม.6

   ☐ ปวช., ปวส., สายอาชีพ ☐ ปริญญาตรีหรือสูงกว่า

6. สถานภาพ

   ☐ โสด ☐ คู่

   ☐ หย่า/แยก

7. อาชีพ

   ☐ ไม่ได้ทำงาน

   ☐ ทำงาน

      ☐ รับราชการ/รัฐวิสาหกิจ

      ☐ ประกอบกิจการเอง

      ☐ อื่นๆ.....

ส่วนที่1 ข้อมูลทั่วไป(ต่อ)

8. รายได้ครอบครัวต่อเดือน

☐ < 5000 บาท ☐ 5,001-10,000 บาท

☐ 10,001-15,000 บาท ☐ 15,001-20,000 บาท

☐ 20,001-25,000 บาท ☐ > 25,000 บาท

9. จ่ายค่ารักษาพยาบาลโดย

☐ จ่ายเอง ☐ เบิกต้นสังกัด

☐ ใช้สิทธิ 30 บาทของรัฐบาล ☐ ประกันสังคม

☐ อื่นๆ.....

ส่วนที่2

ข้อมูลทางคลินิก (สำหรับผู้วิจัย)

1. การวินิจฉัยโรคครั้งนี้……
2. โรคประจำตัว……
3. ระยะเวลาที่นอนโรงพยาบาล……วัน
4. ระยะเวลาที่ใช้เครื่องช่วยหายใจ……วัน
5. ระยะเวลาที่ได้รับการหย่าเครื่องช่วยหายใจโดยวิธี T-piece trial, External continuous positive airway pressure (CPAP), CPAP mode with pressure support of ventilator ……..วัน
6. ทางที่ใส่ท่อช่วยหายใจ
   ขนาดของท่อช่วยหายใจ…….
   ☐ จมูก ☐ ปาก ☐ เจาะคอ
7. ชนิดของการหย่าเครื่องช่วยหายใจ
   ☐ T-piece trial ☐ External continuous positive airway pressure (CPAP)
   ☐ CPAP mode of ventilator ☐ Pressure support of ventilator
8. คำสั่งแพทย์ในการหย่าเครื่องช่วยหายใจ……
9. ประวัติเคยได้รับการหย่าเครื่องช่วยหายใจด้วยวิธีตามที่ระบุ
   ☐ เคย ☐ ไม่เคย
10. ประวัติเคยเข้ารับการรักษาในหอผู้ป่วยวิกฤต
    ☐ เคย ☐ ไม่เคย
11. การใช้ยาในปัจจุบัน
    ☐ ใช้ ☐ ไม่ใช้
    ถ้าใช้ ระบุ ชื่อของยา/ทางที่ให้/ขนาดของยาที่ให้
    ☐ ยาขยายหลอดลม……
    ☐ ยาระบบหัวใจและเส้นเลือดหัวใจ……
    ☐ ยาสงบประสาท
    ☐ อื่นๆ ระบุ……
12. ประวัติการใช้เทคนิคที่ช่วยให้ผ่อนคลายเมื่อมีความเครียดก่อนเข้ารับการรักษาในโรงพยาบาลครั้งนี้……..

ส่วนที่3

แบบสอบถามความชอบดนตรีของแต่ละบุคคล

1. ท่านชอบฟังดนตรีหรือไม่

☐ ชอบ ☐ ไม่ชอบ

2. ดนตรีชนิดใดที่ท่านชอบ (อาจจะตอบได้มากกว่า 1 ข้อ)

☐ แจ๊ส ☐ เพลงพื้นเมือง
☐ คลาสสิก ☐ เสียงธรรมชาติ
☐ พ๊อพ ☐ เพลงลูกทุ่ง
☐ ร๊อค ☐ เพลงไทยเดิม
☐ อื่นๆ.....

3. ดนตรีชนิดใดที่ช่วยให้ท่านรู้สึกผ่อนคลาย (อาจจะตอบได้มากกว่า 1 ข้อ)

☐ แจ๊ส ☐ เพลงพื้นเมือง
☐ คลาสสิก ☐ เสียงธรรมชาติ
☐ พ๊อพ ☐ เพลงลูกทุ่ง
☐ ร๊อค ☐ เพลงไทยเดิม
☐ อื่นๆ.....

4. ท่านฟังดนตรีบ่อยเพียงใด

☐ ไม่เลย ☐ นานๆครั้ง
☐ บางครั้ง ☐ บ่อยครั้ง
☐ สม่ำเสมอ โปรดระบุ.....

5. เมื่อใดที่ท่านรู้สึกอยากฟังดนตรี (อาจตอบได้มากกว่า 1 ข้อ)

☐ รู้สึกกังวล ☐ รู้สึกสนุกสนาน
☐ รู้สึกตึงเครียด ☐ ออกกำลังกาย
☐ รู้สึกเหงา ☐ ทำงานอดิเรก
☐ รู้สึกเสียใจ ☐ ขณะผ่อนคลาย
☐ อื่นๆ.....

6. เสียงธรรมชาติชนิดใดที่ท่านชื่นชอบมากที่สุด

☐ ลมพัด ☐ น้ำไหล
☐ คลื่นทะเล ☐ นกร้อง

ส่วนที่4

□□

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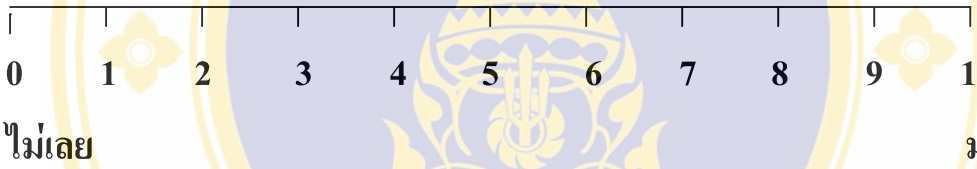
แบบวัดความวิตกกังวล

เครื่องหมายเส้นตรงข้างล่างนี้เป็นตัวแทนแสดงความรู้สึกต่อระดับความวิตกกังวล กรุณาทำเครื่องหมาย xบนหมายเลขที่ตรงกับความรู้สึกวิตกกังวลของท่านมากที่สุดต่อสถานการณ์ ณ ขณะนี้ คะแนนเริ่มจาก 0-10 คะแนน (0 คะแนน หมายถึง ไม่มีความรู้สึกวิตกกังวลเลย ถึง 10 คะแนน หมายถึง มีความรู้สึกวิตกกังวลมากที่สุดเท่าที่จะเป็นได้

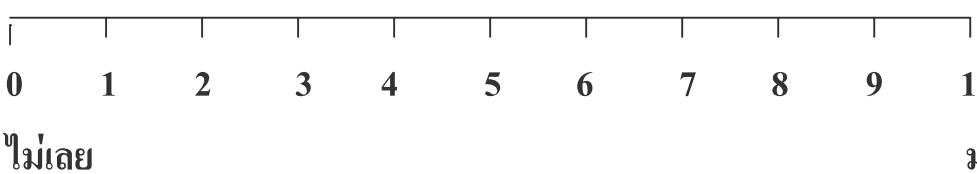
ระดับความรู้สึกวิตกกังวล



แบบวัดความวิตกกังวล

เครื่องหมายเส้นตรงข้างล่างนี้เป็นตัวแทนแสดงความรู้สึกต่อระดับความวิตกกังวล กรุณาทำเครื่องหมาย xบนหมายเลขที่ตรงกับความรู้สึกวิตกกังวลของท่านมากที่สุดต่อสถานการณ์ ณ ขณะนี้ คะแนนเริ่มจาก 0-10 คะแนน (0 คะแนน หมายถึง ไม่มีความรู้สึกวิตกกังวลเลย ถึง 10 คะแนน หมายถึง มีความรู้สึกวิตกกังวลมากที่สุดเท่าที่จะเป็นได้

ระดับความรู้สึกวิตกกังวล



ส่วนที่5

□□

แบบบันทึกข้อมูลทางสรีระ

ลำดับการสุ่ม music/rest or rest/music

□ Music □ No music

Date .....

Time .....

Variables	**Before manipulation**	**After manipulation**
1. Tidal volume (ml) 2. Rapid Shallow Breathing Index (fx/Vt)		

Variables	Time (Minutes)									
	5 mins before beginning	Beginning Point	5	10	15	20	25	30	5 mins after	10 mins after
1. Heart rate										
2. Blood pressure			-		-		-		-	
3. Mean arterial pressure			-		-		-		-	
4. Respiratory rate										
5.Oxygen saturation										

Note. Blood pressure will be measured at 5 minutes before beginning, beginning point, and then every 10 minutes for six times in total.

ส่วนที่6

□□

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แบบสอบถามความพึงพอใจต่อดนตรีบำบัดที่ใช้ระหว่างหย่าเครื่องช่วยหายใจในการวิจัยครั้งนี้

1. ท่านคิดว่าดนตรีบำบัดนี้ช่วยให้ท่านรู้สึกผ่อนคลายขณะหย่าจากเครื่องช่วยหายใจใช่หรือไม่

□ ใช่ □ ไม่ใช่

ถ้าตอบใช่ กรุณาระบุ (อาจตอบได้มากกว่า 1 ข้อ)

□ ลดความวิตกกังวล, กลัว, และความทุกข์ทรมาน

□ ช่วยให้ผ่อนคลาย □ ใช้สะดวก

□ ช่วยให้รู้สึกสงบ □ ประหยัด

□ ลดอาการหายใจเร็วตื้น

□ อื่นๆ……

2. ระยะเวลา 30 นาทีในการฟังดนตรีมีความเหมาะสมหรือไม่ อย่างไร

□ เหมาะสม □ ไม่เหมาะสม

ถ้าตอบ ไม่เหมาะสม, ท่านคิดว่าควรจะนานเท่าไร

□ 15-20 นาที □ 25-30 นาที

□ 30-45 นาที □ 1 ชั่วโมง

□ อื่นๆ……

ท่านคิดว่าควรฟังดนตรีกี่ครั้งต่อวันในระหว่างอยู่โรงพยาบาล

□ วันละครั้ง □ 3 ครั้งต่อวัน

□ 2 ครั้งต่อวัน □ อื่นๆ…….

4. ท่านคิดว่าชนิดของดนตรีที่ใช้ในการทำวิจัยครั้งนี้มีความเหมาะสมหรือไม่

□ เหมาะสม □ ไม่เหมาะสม

กรุณาแนะนำดนตรีชนิดอื่น……..

5. โดยรวมท่านรู้สึกพึงพอใจกับการฟังดนตรีบำบัดครั้งนี้ในระดับใด

□ ไม่เลย □ ระดับต่ำ

□ ระดับปานกลาง □ ระดับสูง

6. ข้อเสนอแนะอื่นๆ……

BIOGRAPHY

NAME	Jiraporn Chontichachalalauk
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INSTITUTIONS ATTENDED	Mahidol University, 1992-1996: Bachelor of Nursing Science Mahidol University, 2000-2004: Master of Nursing Science (Adult Nursing)
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