EFFECTIVENESS OF MUSIC THERAPY ON ANXIETY, PHYSIOLOGICAL RESPONSES, VITAL CAPACITY, AND OXYGEN SATURATION IN MECHANICALLY VENTILATED PATIENTS

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SUMOLCHAT PUANG-NGERN : EFFECTIVENESS OF MUSIC THERAPY ON ANXIETY, PHYSIOLOGICAL RESPONSES, VITAL CAPACITY, AND OXYGEN SATURATION IN MECHANICALLY VENTILATED PATIENTS. THESIS ADVISORS : SOMCHIT HANUCHARURNKUL, M.S.N, Ph.D., CHARN KIATBOONSRI, M.D., (THE AMERICAN BOARD OF INTERNAL MEDICINE AND PULMONARY DISEASE, CRITICAL CARE MEDICINE) 94 p.ISBN 974-665-860-3

This experimental research was designed to test the effectiveness of music therapy in reducing anxiety levels, promoting physiological responses by decreasing heart rate, respiratory rate, blood pressure, and increasing oxygen saturation and vital capacity in patients with respiratory failure using a mechanical ventilator. The sample consisted of thirty patients receiving mechanical ventilation. The study was conducted from July 2000 to January 2001 in three settings: the medical intensive care unit, the coronary care unit, and the intermediate care unit, Department of Internal Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand. Subjects were purposively selected according to pre-determined criteria. Change-over design was used in this research study to compare the changes in anxiety level, vital capacity, physiological responses, and oxygen saturation among the same patients during two periods: the music therapy and no music therapy period. Subjects assessed their music preference and received a chance to select natural music from the collection. In the experimental period, the subjects listened to their chosen music through headphones via portable compact disk player for 30 minutes while receiving mechanical ventilation. In the control period, all subjects received no music therapy, but silent headphones were put on.

The results of the study indicate that during the music therapy period, anxiety level, heart rate, respiratory rate, and mean arterial pressure and systolic blood pressure of the subjects decreased significantly greater than in the control period ($p<0.05$). Vital capacity and oxygen saturation of the subjects during the music therapy period increased significantly greater than in the control period ($p<0.05$). There was no statistically significant difference in the change in diastolic blood pressure between the music therapy and the no music therapy period ($p>0.05$).

The application of music therapy is convenient and inexpensive for patients receiving mechanical ventilation. Music therapy provides an effective and inexpensive means for anxiety reduction and promotes relaxation.

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สุมลชาติ พ่วงเงิน : ประสิทธิภาพ ของดนตรีบำบัดต่อความวิตกกังวล การตอบสนองทางสรีระ ความชุ่มชื่นและความอิ่มตัวของออกซิเจนในผู้ป่วยที่ใช้เครื่องช่วยหายใจ (EFFECTIVENESS OF MUSIC THERAPY ON ANXIETY, PHYSIOLOGICAL RESPONSES, VITAL CAPACITY, AND OXYGEN SATURATION IN MECHANICALLY VENTILATED PATIENTS).คณะกรรมการควบคุมวิทยานิพนธ์: สมจิต หนุเจริญกุล, M.S.N, Ph.D., ชาญ เกียรติบุญศรี, M.D., (THE AMERICAN BOARD OF INTERNAL MEDICINE, PULMONARY DISEASE, CRITICAL CARE MEDICINE) 94 หน้า ISBN 974-665-860-3

การศึกษาครั้งนี้เป็นการวิจัยเชิงทดลอง เพื่อศึกษาประสิทธิภาพของดนตรีบำบัดในการลดความวิตกกังวล และส่งเสริมการตอบสนองทางสรีระ โดยการลดอัตราการเต้นของหัวใจ การหายใจ ความดันโลหิต และเพิ่มความชุ่มชื่นและความอิ่มตัวของออกซิเจนในผู้ป่วยที่มีภาวะการหายใจล้มเหลวที่ใช้เครื่องช่วยหายใจ โดยศึกษาในผู้ป่วยที่ใช้เครื่องช่วยหายใจ ณ. หออภิบาลผู้ป่วยหนักทางอายุรกรรม หออภิบาลผู้ป่วยหนักโรคหัวใจ และหอผู้ป่วยอายุรกรรมชาย-หญิง1 โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล ระหว่างเดือนกรกฎาคม พ.ศ.2543 ถึงเดือน มกราคม พ.ศ.2544 คัดเลือกกลุ่มตัวอย่างแบบเฉพาะเจาะจงตามเกณฑ์ที่กำหนดจำนวน 30 ราย กลุ่มตัวอย่างทุกรายได้รับการประเมินความสนใจในการฟังดนตรีและเป็นผู้เลือกฟังเสียงดนตรีธรรมชาติที่จัดไว้ ในระยะทดลองกลุ่มตัวอย่างฟังดนตรีที่ได้เลือกด้วยตนเองทางเครื่องหูฟังเป็นเวลา 30 นาที สำหรับระยะควบคุมได้รับการใส่เครื่องหูฟังโดยไม่มีเสียงดนตรีเป็นเวลา 30 นาที โดยทั้ง 2 ระยะ ได้จัดให้ผู้ป่วยนอนพักในท่าศรีษะสูงและกั้นม่านพร้อมแขวนป้ายห้ามรบกวน

ผลการวิจัยพบว่า ผู้ป่วยที่ได้รับการฟังดนตรีบำบัดขณะใช้เครื่องช่วยหายใจ มีระดับความวิตกกังวล อัตราการเต้นของหัวใจ การหายใจ ความดันเลือดซิสโตลิกและความดันเลือดแดงเฉลี่ย ลดลงมากกว่าระยะควบคุมอย่างมีนัยสำคัญทางสถิติ($p<0.05$)รวมทั้งความชุ่มชื่นและความอิ่มตัวของออกซิเจนเพิ่มขึ้นมากกว่าระยะควบคุมอย่างมีนัยสำคัญทางสถิติ ($p<0.05$) สำหรับความดันเลือดไดแอสโตลิก ในระยะทดลองและระยะควบคุมมีความเปลี่ยนแปลงอย่างไม่มีนัยสำคัญทางสถิติ($p>0.05$) จึงสรุปว่าดนตรีบำบัดเป็นวิธีการที่ทำได้ง่าย มีประสิทธิภาพ ค่าใช้จ่ายต่ำ เหมาะสมที่จะนำไปใช้ในทางปฏิบัติต่อไป

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CHAPTER I

INTRODUCTION

Background and Rationale

Respiratory failure is the most common problem of critical illness which results in sudden hospitalization. Patients with respiratory failure usually require mechanical ventilator support. Although mechanical ventilation can be life–saving, but it is a cause of major distress for patients. Patient distress resulting from several circumstances associated with mechanical ventilation include fear, thirst, sleeplessness, discomfort, agitation, immobility, confusion, dyspnea, communication difficulties and inability to relax (Fontaine, 1994:702; Fitch, 1989:14; Gries& Fernsler, 1988:55). These events are stressors, which can provoke anxiety among patients and contribute to patient dissatisfaction, delayed healing and prolonged hospitalization.

Anxiety is multifaceted phenomenon composed of physiologic, cognitive and emotional/behavioral dimensions. Physiological response to anxiety is manifested by increased heart rate, elevated blood pressure, increased respiration, increased oxygen consumption and restlessness (Carpaenito, 1989:118; Mazzeo,1995:939; Viney, 1982:205). When anxiety creating stress that may harm the patient and delay recovery is presented in the patient, there is diminished ability of the individual patient to cope (Swindale, 1989:601). To ally anxiety and promote relaxation, nurse frequently administer a variety of intravenous sedative medications to patients receiving mechanical ventilator. Sedation can improve the patient outcome but sedative

medications have a number of untoward side effects that include vomiting, respiratory depression, decreased gut motility, pruritis, urinary retention, hypotension, venous stasis, pressure damage to soft tissue, respiratory and extremity muscle weakness or atrophy. They also can cause delayed weaning from mechanical ventilation, increase risk for infection, mental status changes, central nervous system changes and even death (Cheng, 1995:235; Hausen, et al.,1991:2874; Tung & Rosenthal, 1995:795).

Now, there is greatly noninvasive intervention that nurses can use for reducing anxiety. Music therapy is the most interesting intervention that nurses can initiate to support a holistic approach in caring for mechanically ventilated patients. From the literature reviewed, music therapy has been used in a variety of clinical settings for several reasons. The goals of music therapy ranges from reduction of anxiety and pain to that of feeling of isolation of the individual during the treatment of illness or disability (Coughlan, 1994:35; Dossey, et al., 1988:234).

Therefore the purpose of this study is to determine the effectiveness of music therapy intervention in increasing relaxation by reduction of anxiety, improve physiologic response, vital capacity, and oxygen saturation in patients receiving mechanical ventilator.

Objective

The objective of this research is to compare the changes in anxiety levels, physiologic responses, vital capacity, and oxygen saturation in mechanically ventilated patients between two periods; receiving music therapy period and no music therapy period.

Research Hypotheses

1. During receiving music therapy period there will be greater significant decrease in anxiety level than that during no music therapy period.

2. During receiving music therapy period there will be greater significant increase in vital capacity (VC) than that during no music therapy period.

3. During receiving music therapy period there will be greater significant decrease in heart rate than that during no music therapy period.

4. During receiving music therapy period there will be greater significant decrease in respiratory rate than that during no music therapy period.

5. During receiving music therapy period there will be greater significant decrease in blood pressure than that during no music therapy period.

6. During receiving music therapy period there will be greater significant increase in oxygen saturation than that during no music therapy period.

Scope of The Study

This study was an experimental research using change–over design to test the effectiveness of music therapy in decreasing anxiety, heart rate, respiratory rate, blood pressure and increasing the pulmonary function and oxygen saturation in the mechanically ventilated patients in three settings; the medical intensive care unit (ICU), coronary care unit (CCU), and intermediate care unit, Department of Internal Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok Thailand, from July 2000 to January 2001.

Significance of The Study

If the result of the study supports the hypotheses, then relaxation by using music therapy technique can be used as a complementary therapy to decrease patients' anxiety and improve pulmonary function.

Definition of Terms

Anxiety is a feeling of tension, apprehension and dread. It is measured by the patients' perception of anxiety scale.

Relaxation is a psychophysiology state characterized by parasympathetic dominance that is achieved by specific strategies to evoke the relaxation response. The relaxation response is an alert hypermetabolic state of decreased sympathetic nervous system arousal in which one feels a sense of calmness (Benson, 1975). The relaxation response is evidence by decrease anxiety, heart rate, respiratory rate, blood pressure, improve oxygen saturation and pulmonary function.

Vital Capacity or VC is the maximum volume of forced expiration that is measured by wright spirometer of Ferraris No. Hs 28433. VC is the most recent measure of pulmonary function and is the most accurate to monitor ventilatory muscle function (Kelly & Luce, 1991:1485; Vaz Fragoso, 1993:649).

Music Therapy is defined as the relaxing music intervention, which is assigned for the mechanically ventilated patients. All these musical tapes consist of a soothing type of music with slow steady rhythm, low frequency tones, using no percussion instrument (eg. Drums, Xylophone) and no lyrics.

Types of music used for this study are natural music.They are arranged by Hennie Bekker, John Herberman, Howard Bare, Michael Maxwell, Claude Desjardins and Ron Allen and produced by Gordon Gibson, manufactured and distributed by Solitudes Ltd., Toranto, Canada.

CHAPTER II

LITERATURE REVIEW

This chapter covers literature related to mechanically ventilated patients and nursing intervention in relaxation and relief of anxiety to promote pulmonary function.

The areas reviewed are presented in sequence as follows:

1. Mechanical ventilation
2. Impacts of mechanical ventilator support on patients.
3. Effects of anxiety on mechanically ventilated patients.
4. Management of anxiety in mechanically ventilated patients.
5. Music therapy.

Mechanical Ventilation

Mechanical ventilation is one of the most demanding aspects of critical care. The goal of mechanical ventilation is to provide the right volume of oxygen-enriched and CO_2-free gas to the alveoli. This technique will support pulmonary gas exchange, reducing the work of breathing, promoting rest, and reconditioning of the respiratory muscle (Barnes, 1991 : 258; Berdine & Odriguz, 1990 : 93). The indication for mechanical ventilator support is divided into three categories related to the functions

of the lungs: (1) ventilation, (2) oxygenation, and (3) mechanics. Respiratory failure is the most common clinical indication that frequently requires mechanical ventilation (Adam & Osborn, 1997 : 57 ; Barnes, 1991 : 257).

Management and assessment of patients and machines while receiving mechanical ventilation are very important. Direct assessment of the patient should always precedes assessment of the ventilator system. Patients requiring mechanical ventilator support should appear more comfortable than the level of physiologic distress noted before the initiation of ventilation. The processes of clinical management include physical assessment, monitoring of gas exchange, monitoring pulmonary mechanics, monitoring of Auto - PEEP and waveforms, and monitoring function of patient - ventilator system (Adam & Osborne, 1997 : 70 ; Kacmarek., In Pierson & Kacmarek ed, 1992 : 975).

Nursing intervention for management of the mechanically ventilated patient is one of the most important and demanding tasks of the respiratory care such as suction - therapy, oral care, eye care, elimination, care of joints and skin, and physiotherapy (Ashurst, 1997 : 449; Adam & Osborne, 1997 :82). The priorities of management includes operating equipment safely, minimizing complications, weaning patients from ventilator as soon as possible, and establishing effective means of communication (Black & Matassarin-Jacobs ed, 1993 : 953; Schneider & Slatten., In Brown ed, 1993 : 65).

Impacts of Mechanical Ventilator Support on Patients

The impacts of mechanical ventilation on patients can occur by the equipment itself, artificial airway, respiratory care, development of illness. It can also

occur by other treatments such as sedation, muscle relaxation, antibiotic drugs, bronchodilators (Lumb & Gsllagher, In Ayres et al, eds., 1995: 1163; McCartney & Boland, In Flaschen, ed., 1994 : 678). The impacts are divided into two types: physiological and psychological impacts.

Physiological impacts

The method of mechanical ventilation including positive - pressure ventilation can produce impact on the cardiovascular and renal system by reducing venous return to the heart and glomerular filtration rate. Barotrauma and subsequent complication such as tension pneumothorax can occur when patients attempt to normalize carbon dioxide tension which necessitate aggressive ventilation with large inflation volumes and enlarged peak airway pressures (Bidani, et al., 1994 : 957; Bongar & Sue, 1994 : 60; Parrillo & Bone, 1996 : 124 ; Worthley, 1994 : 40). Unintended hyperventilation is common when patients are first placed on mechanical ventilation which induce respiratory alkalosis and respiratory distress, it indicates the patients failure to match ventilator setting (Pierson, In Pierson ed., 1992 : 1004).

Interventions and procedures related to mechanical ventilation may provide direct impacts to patients. Endotracheal tubes initiating tracheal and laryngeal trauma, and nasal intubation may result in paranasal complication (Stauffer & Silvestri, 1982 : 417-34 ; Strieter & Lynch, 1988 : 127-39). The use of a respiratory suction system may result in cross contamination and tracheal trauma and patient discomfort (Ashurst, 1997 : 449 ; Sidris, et al, 1975 : 34).

When patients require mechanical ventilator support, the process of mechanical ventilation develops physical impairment which decreases self-care agency. The development of physical impairment occurs by restricting mobility,

limiting the ability to perform the activities of daily living independently, losing of control, and impeding oral intake. Restricted physical mobility increases risk of pulmonary infection, deep vein thrombosis and peripheral edema, muscle atrophy, joint stiffness, urinary tract infection, and increase risk of pressure sore. The other impacts involve the dependence on the equipment, sensory alteration, sleep deprivation, and pain (Cornock, 1998 : 520 ; Fitch, 1989 : 14 ; Gries & Fernsler, 1988 : 57 ; Jablonski, 1994 : 198 ; Johnson & Sexton, 1990 : 51 ; Make, 1986 : 307 ; Menzel, 1998 : 249).

Psychological impacts

Most of the mechanically ventilated patients are treated in critical care setting, thus psychological impacts arising in the critically ill - patients may provide insight into the psychological disturbances that develop in those receiving mechanical ventilation. Psychological problems have been reported to arise from 14 to 72 percent of critically ill patients compared to an incidence of less than 1 percent in non - critically ill patients (Criner & Issac, In Tobin ed., 1994 : 1166).

The development of the psychological impacts is probably multifactorial; likely factors include the patient's baseline psychological function, physiological disturbances as a result of the underlying pulmonary disease and disturbed gas exchanged, age, drug used for sedate and paralyze patients, the effects of the critical care environment on sleep and sensory deprivation, staff interaction with the patients, family, procedures performed and the equipment used, and fear of death (Chen, 1990: 246; Cochran & Ganong, 1989 : 149; Criner & Issac, In Tobin, ed.,1994:1172; LaFond & Hornerr, 1988 : 249; McHugh, et al, In Pierson ed., 1992 : 1221; MacKellaig, 1987:

176; Riggio, et al,1982: 368). Moreover, the process of mechanical ventilation produces the development of psychological impacts by restricting patients mobility, limiting activities of daily living, disturbing sleep pattern, losing self of control, impeding communication. All impacts induce several types of psychological stress that the mechanically ventilated patient may encounter, including depersonalization and dehumanization, sensory overload, sensory deprivation, loss of privacy, psychological immobility (Corncock, 1998 : 518-27; Fitch, 1989 : 13-6 ; Gries & Fernsler, 1988 : 57 ; Jablonski, 1994 : 198; Johnson & Sexton, 1990 : 54 ; Make, 1986 : 303-10 ; Menzel, 1998 : 249).

In addition to the stresses faced by critically ill patients, mechanically ventilated patients encounter the additional stress of being dependent on a machine for breathing. Recent studies have reviewed the particular feelings evoked by the critical care environment combined with the dependence on ventilator support. Riggio, et al. (1982) obtained perceptions of mechanically ventilated patients on sources of psychological stress and found that the inability to communicate, disorientation, memory loss, pain, and discomfort were perceived as significant problems. Bergbom-Engberg and Haljamae (1989) assessed patients' retrospective recall of their emotional reactions to mechanical ventilation after discharge. They found that 47 percent of patients felt anxious or fearful during their period of mechanical ventilation, and 90 percent of patients recalled the experience as stressful or unpleasant for up to 4 years post treatment.

Ventilator support involves a loss of independence and control over the most vital of voluntary life-sustaining activities and breathing are the host of emotional stressors specific to mechanically ventilated patients. The study of Gale and

O'Shannick (1985) pointed out that patients are not only unable to talk or communicate while intubated but also cannot sigh, gasp, sneeze, or produce other emotional expressions that are part of the usual respiratory vocabulary. The inability of ventilated patients to fully communicate their physical and emotional needs to others creates further isolation and feelings abandonment by family and staff (Gale & O' Shannick, 1985 : 98 ; LaFond & Horner, 1988 : 253).

The mechanically ventilated patients will attempt to manage the stress of their stay in critical care setting with their characteristic coping mechanism. They may try to cope with stress by suppressing their feeling, or trying to anticipate a return to good health (Eisendrath, In Van et al, eds, 1984 : 157 ;Tesar & Stern, 1986 : 140). If these techniques fail, the individual may turn to develop anxiety that has adverse influence to recovery.

Effects of Anxiety on Mechanically Ventilated Patients.

Anxiety is a state of disequilibrium or tension caused by apprehension of possible misfortune, increased motor tension of activity, and autonomic arousal that prompts attempts at coping (Adam & Osborne 1997 : 18 ; McCartney & Boland, 1994 : 644). Anxiety arises from stress experienced by individuals and from their response to the stressors. The term stress as defined by Spielberger (1976) refers to stimulus conditions or stressors that produce anxiety reactions. Anxiety is the one of common psychological reactions in the critical care setting which may include threats to physiological as psychological. One outcome of these anxious response is an increase

in the number of nightmare reported by critically ill patients (McHugh, Clark, Pierson, In Pierson ed, 1992 : 1225).

Anxiety is a complex psychophysiologic process (Guzzetta & Forsy th, 1979 : 32 ; Spielberger, 1976). It can be assessed in the physiologic, cognitive, and emotional / behavioral dimensions. These illustrate the relationship between mind and body. Mind and body have been found to be in continuous communication through three major systems: the autonomic nervous system, the musculoskeletal system, and the psychoneuroimmune system. These systems constantly respond to messages carried through the body in the response to stress (Wells-Federman, 1995 : 61).

In mechanically ventilated patients, anxiety may stem from dependency and the prospect of permanent disability, fear of death, inability to communicate their needs, the discomforts associated with mechanical ventilation, or the sensation of dyspnea (Criner & Isaac, 1994 : 49 ; LaFond & Horner, 1988 : 242). All these situations are perceived as stress threatening to their security which they try to control by reducing the stressors. The response to the stressors begins at the cerebral cortex. In physical dimension, the physical response is that the cerebral cortex registers all threats and stimulates the hypothalamus, which in turn activates the sympathetic branch of the autonomic nervous system (ANS) to act directly on enervated heart and blood vessels. Neural messages are transduced along the ANS via two hormones (norepinephrine and epinephrine), which can produce a generalized arousal of the body, including increase in cardiac contractility, heart rate, arise in blood pressure, heightened awareness of the environment, shifting of blood from the visceral organs to the large muscle groups, increases in muscle tension, altered lipid metabolism, increase platelet agglutination, increase oxygen consumption, and an increase in

respiration. The psychoneuroimmune is also affected. The stressors causes the hypothalamus to secrete corticotropin-releaseing hormone, which in turn causes the adrenal cortex to secrete corticosteroids. Corticosteroids are responsible for increased blood sugar, sodium retention, alterations in lipid metabolism, a decrease in immune function (Adam & Osborne, 1997 : 12 ; Wells-Federman, 1995 : 59 ; Wilson & Kneis, 1988 : 131). In the emotional / behavioral dimension, patients may be irritable, angry, withdrawn, restless, aggression or lack of cooperation. In cognitive dimension, patients may have narrowed or distorted perceptual field, lack of attention to details, and difficulty in focusing (Smith & Dvell, 1989 : 212).

The significant affectation of anxiety on mechanically ventilated patients is having decreased tolerance to mechanical ventilation. It can be caused by increasing work of breathing, increasing energy requirements, and impairing synchrony between a patient's efforts of inspiration and their rhythm with the ventilator (Criner et al, 1994 : 852 ; Hansen-Flaschen, 1992: 385 ; Knebel, 1991 : 321-31). Decreasing of tolerance to mechanical ventilation can contribute to problems in weaning and induce the patients requiring long-term ventilation (Goldstein & Haltzman, In Stoudemire et al. eds., 1993:250).

Management of Anxiety in Patients with Mechanically Ventilator

A significant role in nursing practice is the improvement of patient outcome and functional status for ventilation. Developing strategies for management of anxiety to maximize patient tolerance to mechanical ventilation is one of the most significant aspects of nursing practice, which needs attention from both physical and psychosocial perspectives. This is because of the interaction of multiple factors such as serious

medical illness, personality, psychiatric illness, medication, critical care environment, and process of mechanical ventilation can be a cause of anxiety (Gale & O'Shanick, 1985 : 102 ; McCartney & Boland, 1993 : 90).

The priorities of management include promoting self-esteem, prevention of powerlessness, minimizing environmental and emotional stress in patients. Thus, management of anxiety in the mechanically ventilated patients involves assessment, maintenance of providers and family relationship, promotion of patients' sense of control and ability to interact, providing strategies of coping and anxiety-reducing skills (Cassen, In Shoemaker eds., 1989 : 1408 ; Criner & Issac, In Tobin ed., 1994 : 1169 ; Fontaine, 1994 : 698).

Psychological Intervention

In the mechanically ventilated patient, a treatment plan must be specific to the special problems created by mechanical ventilation. The factors contributing to anxiety are precipitated by the need for mechanical ventilation such as; critical care environment, limited mobility, impaired communication. They should be identified and systematically dealt with to improve the patient's sense of control and ability to interact appropriately with the family and providers (Criner & Isaac, In Tobin ed., 1994 : 1171 ; Jenny & Logan, 1994 : 32 ; Johnson & sexton, 1991 : 49).

One of the first goals for the psychological intervention is to provide a setting that minimizes patient seclusion and enhance interaction with others. There are several studies indicate that psychological problems commonly seen in critically ill patients may arise from the environment (Isaac & Hungerpillar, 1986 : 98; Tomlin, 1977 : 441).There are strategies to minimize environmental stress by (1) placing

patients in individual rooms; (2) minimizing nocturnal interventions to maximize the period of uninterruped sleep; (3) reducing the amount of monotonous sensory input by placing monitoring equipment outside a patient's room; (4) increasing patient mobility as much as possible; (5) equipping a patient's room with orientation aids such as clocks, calendars, radio, television and family artifacts; and (6) making an outside window visible to each patient (Kleck, 1984 : 25 ; Urban, In Kinney ed,.1988).

Providing the effective communication in mechanically ventilated patient is an important step in normalizing the patient's environment and minimizing anxiety. Knowing the patient as the unique individual with endotracheal tube and mechanical ventilation is essential to reduce anxiety. Endotracheal tube inhibits normal communication and ability to speak, thus improving communication between patients and their families decreases stress, improves decision making, and decreases the likelihood of patient isolation and withdrawal (La Fond & Horner, 1988 : 245 ; Jenny & Logan, 1994 : 29). Methods of communication are frequently based on experience and trial and error (Connolly & Shekleton, 1991 : 117). Lip reading, mouthed words, pointing, writing with pencil and paper, using a picture or alphabet board and interpreting nonverbal are several techniques used to communicate (Gries & Fernsler, 1988 : 54 ; Stovsky et al., 1988 : 285). The providers should encourage the patients to consistently use the device so that they can improve their communication skills and decrease the sense of isolation.

In some patients, the selective use of psychotrophic medication may be used in addition to behavioral techniques and support psychotherapy. Short-acting anxiolytic agents, specifically benzodiazepines, may be useful in treating extreme anxiety (Sandhu, 1986 : 631).

Cognitive-behavioral strategies

Before becoming a mechanically ventilated patient, most individuals have a repertorie of coping and anxiety-reducing skills. Acknowledgment these skills and assisting the patient to use them while receiving mechanical ventilation are useful for the patient. Results from telephone survey the method used to reduce anxiety in over 1500 medical ill patients, revealed that nearly one-third of the patients used unconventional medicine such as relaxation techniques, music therapy, chiropractic, massage, imagery, biofeedback, or hypnosis (Eisenberg, et al.,1993: 248).

Cognitive-behavioral therapies were mostly used in reducing stress or anxiety. They are in a category of self-regulation strategies that are helpful in treating patient's distress caused by anxiety (Dossey, 1991 : 32 ; Eisenberg, et al., 1993 : 249). These interventions work to change patient perceptions of the known stressful experience. They can easily accompany the physiologic care of patients, and are beneficial in weaning from mechanical ventilation (Holliday & Hyers, 1990 : 1215 ; Jenny & Logan, 1994 : 33 ; Miller & Perry, 1990 : 141).

Recent studies examined effects of biofeedback on reducing anxiety and facilitate weaning in ventilator - supported patients. Corson, et al. (1979) used biofeedback in an uncontrolled fashion to wean two paralyzed ventilated patients by altering breathing patterns to increase tidal volume (Vt) and reduce respiratory rate. Biofeedback sessions were conducted for 40 minutes each day, three or four times a week for 3 months. The patients were provided with visual feedback on an oscilloscope of Vt and respiratory rate measured by a pneumotachograph, placed in the breathing circuit, or by changes in chest wall impedance. These visual signals were used as targets during biofeedback sessions to increase tidal volume and slow

respiratory rate. Over the 3 month period, the two patients were successfully weaned from mechanical ventilation. Similar results were reported by LaRiccia, et al. (1985), who used biofeedback, based on chest wall movements recorded by a pair of magnetometers, to wean a patient with multiple sclerosis from mechanical ventilation. Holliday and Hyers (1990) used biofeedback to improve weaning outcomes in 40 patients ventilated for 7 days or more. Patients were given visual and auditory feedback from rib cage and abdominal compartmental changes during Vt generation measured by inductance plethysmography. A display of frontalis muscle EMG activity was used to control anxiety by muscle relaxation. Patients randomized to the biofeedback group, received 30 to 50 minutes training sessions 5 days per week until they were extubated. The biofeedback group showed a significant reduction in mean ventilator days compared to the control group (20.6 + 8.9 days versus 32.6 + 17.6 days). That was associated with a significant increase in Vt (415 + 45 ml versus 295 + 41 ml), mean inspiratory flow (560 + 66 ml/s versus 361 + 40 ml/s), and Vt / diaphragm EMG (0.95 + 0.21 liters / mv versus 0.33 + 0.09 liters / mv). In addition, patients who received biofeedback reported a significant reduction in anxiety and felt more relaxed during the biofeedback sessions.

Many studies in animals and humans have shown that the application of airflow or cold solutions to the pharnyx, nasal mucosa, or face may result in a reduction in anxiety and the sensation of dyspnea in patients with chronic lung disease and ventilator-dependent patients. Schwarzstein, et al. (1987) studied the effect of cold air (4 to 10 C, 4 km / h) directed to cheeks on the sensation of anxiety and dyspnea in 16 normal subjects breathing against an inspiratory resistive load while

$PaCo_2$ was maintained at 55 mmHg. Although minute ventilation remained unchanged, cold air produced a significant reduction in anxiety and dyspnea.

The review of anxiety - reducing interventions which based on body -mind perspective or holism showed that the parts or processes of all things are perceived as combined into wholes rather than separate fragments. Biobehavioral interventions are used to treat the anxiety, stress in acute and chronic illnesses. They are used to establish a sense of balance and control in one's emotional status, which in turn directly affects the physiologic status. However, these strategies might be too difficult for the patients with mechanical ventilator except for music therapy. Music therapy is appropriate to assist patients through their mechanical ventilator experience because it is an integral part of most person's lives and is a comforting, familiar stimulus. Music therapy does not require much practice and concentration by patients to be effective.

Music Therapy

Music therapy has been used for centuries to promote relaxation and reduce anxiety and pain. Music and medicine have been linked throughout history for therapeutic purpose (Cook, 1981 : 258 ; Standley, 1986 ;69). Ancient Greeks and Romans believed music had magical charm and power to aid the body and soul in healing (Buckwalter et. al, 1985 : 65).

Music therapy has been defined by Bruscia (1989), as a systematic process of intervention wherein the therapist helps the patients to achieve health, using musical experiences and the relationships that develop through them as dynamic forces of change, while it has been defined by Schulbert (1981), as a behavioral science

concerned with using different kinds of music to effect changes in behaviors, emotion, and physiology.

Music was used first as a therapeutic intervention in the 1800s (Henry, 1995:295). The therapeutic use of music are varied. The music is used with specific patient populations to release emotion and feelings, energize the physical body and provoke it to movement, uncover meaningful memories, become a metaphor - a holder - of life experience, relax the body and mind to offer spiritual nurturance, and self - exploration is available for exploration (Bonny, 1997 : 69).

The discipline of music therapy gives emphasis to two areas of music experience : the **expressive** and the **receptive**. Expressive includes the performance evoking of music of which spontaneous improvisation, composition of group songs, movement to music and drawing are illustrations. The receptive is the listening or receiving of music in an alert or quiescent state. The expressive is more active and encourages interaction with one's environment whereas the receptive methods require a deep inflow of the music material to raise images and memories to evoke aesthetic imprint and personal change (Bonny, 1997 : 71).

Physiologic and Psychological Effects of Music Therapy

Music can induce both physiological and psychological responses to listener. Music itself is defined as a complex web of expressively organized sound (Chlan,1999: 35). It contains three essential elements as follow:

1. **Rhythm** is the order in the movement of music. It is the most dynamical aspect of music and is a key factor in selecting particular pieces of music for specific purpose. For example, body systems (i.e. respiration, heart rhythm, circadian patterns,

gait) are an integral part of human life, and music can play an essential role in harmonizing these rhythms (Bunt, 1994). Rhythm can also cause changes in mood state (Bonny, 1986 : 5). Steady, slow repetitive rhythm are thought to exert a hypnotic or relaxing effect on listeners.

2. Melody of music is due to the sequence of musical pitch and the distance between the musical tones (Bunt, 1994). The melody of a musical piece contributes to the listener's emotional response to the piece.

3. Harmony in music is due to the way pitches are blended together, with the combination of sounds described as consonants by the listener (Bunt,1994).

The nature of music appeals to the right hemisphere of the brain, which is involved in intuitive, creative, and imaginative ways of processing information and which evokes phychophysiological responses through its influence on the limbic system, the center of emotions, feelings, and sensations (Guzzetta, 1995 : 671). The limbic system is involved in sensations of reward, punishment, pleasure, and pain. Music provides an immediate reward experience for listeners through the activation of the brain - reward centers via the release of enkephalins and endorphins, the body's natural mood - altering substances and pain killers (Thaut, In Unkefer ed., 1990 : 15).

The two components of auditory impulses and central nervous system are involved in the stress response to lend support for physiological effects of music therapy. The first component involves an endocrine response, whereby corticotropin-releasing hormone (CRH), secreted from the hypothalamus, stimulates adrenocorticotrophic hormone (ACTH) released from anterior pituitary and results in elevated plasma cortisol levels. The second component involves the autonomic nervous system, whereby the lucus ceruleus (LC), located at the junction of midbrain

and pons, stimulates release of norepinephrine from central and peripheral sympathetic nerve terminals and release of epinephrine from the adrenal medulla, lending to increased anxiety, heart rate, and blood pressure (Johnson, et al 1992,:118). Neural impulses produced by music may mediate changes in heart rate, blood pressure, and anxiety level by affecting release of CRH from the hypothalamus or release of norepinephrine from the lucus ceruleus/ sympathetic nervous system.

Music exerts its effect via entrainment or synchronization of body rhythm with the musical selection (Bonny, 1986 : 8). Entrainment is a process whereby two object vibrating at similar frequencies will tend to interact and come into synchronize with one another, thereby resonating at the same frequency (Bunt, 1994). The entrainment of body rhythm with relaxing music is thought to decrease sympathetic nervous system activity, resulting in a dampening in the arousability of the central nervous system (Bonny, 1986 : 15 ; Merritt, 1990). These response, in turn, lead to decreased adrenergic activity, altered states of consciousness, and decreased neuromuscular arousal, all manifested as physiological indicators of the relaxation response by decrease in heart rate, respiratory rate, metabolic rate, oxygen consumption, skeletal muscle tension, epinephrine level, gastric acidity and motility, and sweat gland activity, with decreased blood pressure in hypertensive individuals (Everly & Enson, 1989 : 18).

Limitation for The Application of Music Therapy

The selection of music is important because music may have either a calming or stimulating effect. An orderly arrangement of sound consisting of melody, harmony, rhythm, tone, and pitch has a vary personal and intimate meaning for each

individual (Moss, 1987 : 15 ; Standley, 1986 : 76). Responses to musical stimuli vary and are subject to previous experience and sociocultural influences. Finding such factors as the environment, health state, degree of alertness or fatigue, degree of familiarity with music used, music preference, and previous musical experience could have an influence on the effects of music (Bonny, 1986 : 8 ; Guzztta, 1995 : 671 ; Stevens, 1990 : 1049).

Music can also elicit highly idiosyscratic responses in listeners. These responses can be influenced by the characteristics of the music and by numerous variables with in each listener. Assessing patients' musical preferences and determining their past experiences with music is imperative in music therapy because personal preference has such a strong impact on listeners' response to music (Bonny, 1986 : 7 ; Guzzetta, 1995 : 684).

Research Related to Music Therapy

Regarding the concept based on mind - body connection to music therapy and its physiological and psychological effects to the listeners, there were many studies which were based on this concept in relation to the psychophysiological effects of music therapy for promoting physiological relaxation, reducing state anxiety and pain, and improving mood in a variety of clinical settings.

During the last two decades, music therapy has been a focus of research studies in a variety of clinical populations. Kaempf and Amodei (1989) studied 33 outpatient arthroscopy patients in the preoperative holding area. Subjects were randomly assigned to a music group or control group. Those in the music group listened to 20 minutes of researcher - selected classical music played in the hall. After

listening to sedative music, patients in the music group showed significant decrease in their anxiety and respiratory rates as compared to the no-music group.

Updike and Charles (1987) using a pretest / posttest design, studied 10 plastic surgery patients in the preoperative ambulatory setting. Each subject selected and then listened with headphone to one of five taped programs of classical or contemporary music for 30 minutes. Patients reported their emotion state change toward relaxation and calmness. In addition, following the music treatment, BP and HR were decreased. Steeflman (1990) studied 45 patiens scheduled for hand or wrist surgery under local or regional anesthesia. Subjects were randomly assigned to a music group or a verbal distraction group. Subjects in the music group selected one of five types of tape music and listened to the music from time of skin preparation until dressing application. Both groups experienced a reduction in anxiety. Moreover, the music group experienced a decreased in systolic blood pressure.

In critical care setting, music had also been used for its anxiolytic effect during hospitalization. Guzztta (1989) studied the effectiveness of relaxation and music therapy of 80 cardiac care unit patients in three eastern United States hospitals admitted with a presumptive diagnosis of anterior myocardial infarction. The subjects were randomly selected to one of three groups : music therapy group, relaxation group, or control group. The relaxation group received a relaxation technique 20 minutes twice a day for a total of 3 sessions over a 2 - day period. The music therapy group received music following the same schedule. the findings revealed that patients had fewer cardiac complications than expected when exposed to music, and there were fewer angina episodes in patients with ischemic heart disease.

Stone et al. (1989) investigated the physiologic and psychologic effects of music therapy on critically ill patients in the ICU (11 males and 11 females). Patients' music preference that was utilized for the study included jazz, popular, classical, new age, gospel, soft rock and country western. Their study indicated that music therapy positively affects the critically ill patients by reducing their heart rate, systolic blood pressure, pain, and anxiety.

In addition to relaxation techniques, music therapy has been used as a behavioral intervention for patients receiving chemotherapy. Lane (1993) reported the use of music therapy at a cancer center for hospitalized patients and its psychological and physiological benefits. Two subject groups of 20 each were randomized to control and experimental group. The control group participated in normal hospital routines, while the experimental group received 30 minutes of interactive music therapy. Immunoglobulin A (IgA) levels were measured pre and post intervention as an indicator of the status of the immune system. Result indicated that there was a significant increase in IgA in the experimental group. This reflected a physiologic effect from the music therapy.

Mynchenberg and Dungan (1995) studied the effects of relaxation and music therapy on the anxiety levels of 5 cardiac - compromised subjects in a critical care unit. The Visual Analog Scale (VAS) was used to measure pre - and postintervention anxiety levels. Blood pressure, and respiratory rates were also measured immediately prior to and after the interventions. The relaxation therapy consisted of listening to a 25 minutes audiotape of Pachelbel's canon. A voice dubbed over the first 15 minutes of the music guided the patient toward relaxation. The subjects performed the interventions 2 hours prior to or after meals, voided before beginning the exercises,

and were helped to a comfortable position. Interruptions were kept to a minimum by having staff place a sign on the door to prevent intrusion. The result from one case study was presented in detail. The subject's anxiety level changed by 4 cm ; her blood pressure, systolic and diastolic, decreased by 6 mm Hg. The pulse rate decreased by 3 beats per minute.

Dubois et al.(1995) studied 49 outpatients undergoing bronchoscopy procedures. The patients who listened to music reported significantly greater comfort levels and less coughing than those who did not listen to music during their procedures.

A variety of clinical outcomes has been used to measure the effectiveness of music therapy as a nursing intervention on hospitalized patients. Nurses can facilitate positive patient outcomes by using music as a therapeutic tool. The goals of music as a nursing interventions are mood modulation, expression of creativity, examination of thought process, and anxiety reduction.

According to the literature reviewed, there was little specific research of music therapy for reducing anxiety and promoting pulmonary function in mechanically ventilated patients. Studies related to music therapy in mechanically ventilated patients were started by Chlan (1998). The investigator studied the effects of music therapy on relaxation and anxiety reduction of 54 patients receiving ventilatory assistance in four urban midwestern intensive care units. Using pretest - posttest experimental design with repeated measures, subjects were randomly assigned to a music group or control group. The music group received listened to music for 30 minutes and the control one received a rest period for 30 minutes. It was observed that subjects who received music therapy reported significantly less anxiety posttest (10.1)

than those in the control group (16.2). Heart rate and respiratory rate decreased overtime for these subjects in the music group as compared with those for the control group subjects.

From this literature reviewed, it has been found that the music therapy is an effective intervention for promoting physiological relaxation (as indicated by decrease in heart rate, respiratory rate, and blood pressure), reducing anxiety, and improving mood in anxious patients. The theoretical framework used in this study was based on the strong bidirection relationship between the mind and the body (Benson, 1976) and theory of anxiety (Spielberger, 1972). It is based on the hypothetical rational that mechanically ventilated patients would response to relaxing music by reducing apprehension and tension, sympathetic stimulation, and improve pulmonary function by increase VC.

Based on the conceptual framework, respiratory failure is the major cause of critical illness which results in sudden hospitalization and require mechanical ventilation in critical care unit. Hospitalization, critical care environment, and mechanical ventilator are stressful events for patients. For these patients, the stress of their critical condition is heightened by their dependence on a mechanical device for survival. Stressors in the critical care environment and mechanical ventilation, as perceived by patients, include physical impairment, dependence on ventilation, and impaired communication. All these distress foster a patient's sense of anxiety. Distraction may limit anxiety by shielding the patient from unpleasant sensation (McCaffery & Beebe, 1989: 172). Music therapy is a valid option to offer patients a way to inhibit their own anxious reaction. Music helps them to achieve relaxation through its effects on the limbic system and the body-mind neurohormonal axis. The limbic system is

involved in the relay of emotional states to the endocrine system. It has connection with the cerebral cortex for transmissions of social and emotional influences, and connection with the hypothalamus for control of endocrine activity. Music can induce relaxation response by providing an immediate reward experience through the activation of brain-reward centers via the release of enkephalins and endorphins. The others response is that of neural impulses produced by music may immediate changes in physiological responses by affecting release of CRH from the hypothalamus or release of norepinephrine from the sympathetic nervous system. These actions induce in decreasing sympathetic activity and results in decreasing in anxiety, HR, RR, BP, oxygen consumption, and muscle tension. Improving respiratory muscle tension facilitates ability of respiratory muscle function and also improves gas exchange that showed by increasing VC and oxygen saturation. Decreasing in oxygen consumption results in increasing in oxygen delivery to the vital organs and improve in oxygen saturation (Figure 1).

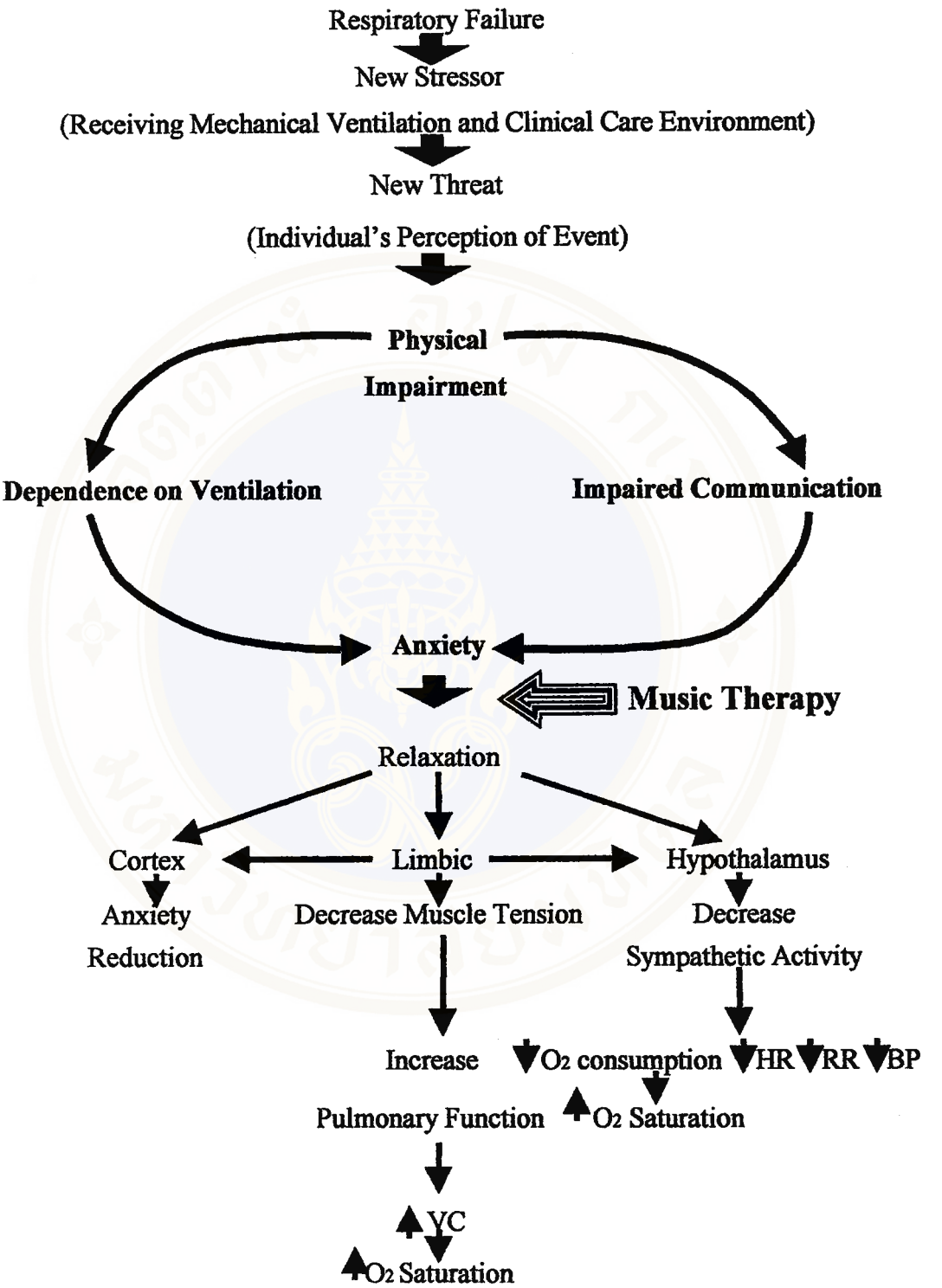


Figure 1 Conceptual framework of the study

CHAPTER III

MATERIALS AND METHODS

This experimental research used change – over design to compare changes in anxiety levels, physiologic response, vital capacity, and oxygen saturation in mechanically ventilated patients at two periods; control period without music therapy and experimental period with music therapy. Patients in the control period received undisturbed 30-minute rest time and in the experimental period they received music therapy during mechanical ventilation in addition.

The Study Sample

The target population of this study were the mechanically ventilated patients in three settings; the medical intensive care unit, coronary care unit and intermediate care unit, Department of Medicine, Ramathibodi Hospital. Thirty patients were selected by purposive sampling via the following inclusion criteria:

1. Being diagnosed as having respiratory problem and receiving mechanical ventilation.
2. Aged 18 years or over.
3. Be oriented to person, place, and time.
4. Ability to understand the Thai language.
5. Willingness to participate in this study.

6. Ability to communicate.

7. Not receiving continuous intravenous sedation.

8. Having Acute Physiology and Chronic Health Evaluation (APACHE II) score of 15 or below.

The **exclusion criteria** were as follow:

1. Having no interest in music therapy.

2. Having unstable conditions during this study, for example shock, fever, severe dyspnea.

The duration of study was from July, 2000 to January, 2001. There were 30 patients, in keeping with the principle of Polit and Hungler (1983;427), who mentioned that the sample size should consist of 20-30 cases. In cases of comparison, the number of samples in each group should not be less than 10 cases, depending on the research design. This study used change-over design, in which all subjects served as their own control so they were in both the experimental and control periods.

Settings

In this study, data are collected at the intermediate care unit and the critical care units in two settings; the Medical Intensive Care Unit (MICU) and Coronary Care Unit (CCU), Department of Medicine, Ramathibodi Hospital, Bangkok, Thailand, from July 2000 to January 2001.

Instrumentation

The instruments of this study were composed of two parts as follow

1. Experimental Instruments include:

1.1 Portable compact disk player (Sony No. D-E 441)

1.2 Headphones (Sony No SBC 3155a).

1.3 Four sets of natural music collection, which were made by blending the soothing music with the sounds of nature including sound of the wind, sound of a stream, sound of the sea, and sound of songbirds.

The selections of music used in this study were

1. Wind sounds arranged by David Bradstreet (SOCAN): Winding path, Walk softly, Revitalise, Sparkling sky.

2.Stream sounds arranged by Michael Maxwell (SOCAN): Streaming, Morning light, Sheltered shore.

3. Sea sounds arranged by Michael Maxwell (SOCAN) : The Canon Stirs, Beyond the Horizon, In A Protected Cove, Forever By The Sea.

4. Songbirds sounds arranged by John Herberman (SOCAN): New England Spring, Northern Mist, Southern Symphony, Coastal Horizons.

All music selections were produced by Gordon Gibson.

1.4 Portable bedside monitors with full option (Envoy Monitoring System-Model Series No. 554-000-000). This noninvasive device was fully automatic and was preset for measurements at 10-minute intervals. The machines were calibrated by a product engineer from the biomedical instrumentation laboratory of Thai GL Co., Ltd. before the measurement was carried out.

1.5 Poster with word " Do Not Disturb"

1.6 Eye pads.

2. Data collected Instruments include:

2.1 Demographic Data Questionnaire, which was used to obtain some basic personal information including name, surname, sex, age, marital status, religion, hometown, education background, family income and occupation **(Appendix B Part I).**

2.2 Clinical Characteristic Data Questionnaire, which contained data of underlying disease, primary medical diagnosis, type and mode of ventilation, number of days receiving mechanical ventilation, length and type of intubation, medication and previous of current use of relaxation techniques **(Appendix B part II).**

2.3 Music Therapy Assessment Tool, which was used to assess patient's music preferences, like and dislike, and the importance of music in their life **(Appendix B part III).**

2.4 Open-ended Satisfaction Questionnaire, which was used to evaluate and describe patients' satisfaction and advantages when using music therapy while receiving mechanical ventilation **(Appendix B part IV).**

2.5 Physiological Recording Form, which was used to record data of heart rate, respiratory rate, blood pressure oxygen saturation **(Appendix B part V).**

2.6 Anxiety Scale, which was used to measure anxiety level in mechanically ventilated patient. A straight line which had the number indicated the level of anxiety ranging from 0 = no anxiety at all to 10 = as much as could possibly be **(Appendix B part V).**

2.7 Pulmonary Function Recording Form, which was used to record VC **(Appendix B part V).**

2.8 Wright Respirometer of Ferraris No. Hs 28433 , which was used to assess pulmonary function by measuring VC. It was calibrated by a product engineer from the Biomedical Instrumentation Laboratory of E for L Co., Ltd.

2.9 APACHE II was used to stratify the severity of illness and to predict the mortality in an individual **(Appendix C).**

Data Collection

After permission was given from the Faculty of Graduate Studies, Mahidol University, data were collected by the following steps :

1. Asking for permission to collect data by submitting the document from the Faculty of Graduate Studies, Mahidol University, to the Dean of Medical Faculty, Head of the Nursing Faculty, Heads of the medical intensive care, coronary care unit, and intermediate care unit, Ramathibodi Hospital, Mahidol University.

2. Screening for eligible subjects based on the inclusion criteria by checking medical record of the medical intensive care unit, coronary care unit, and intermediate care unit.

3. All eligible subjects were approached and before the data had been collected, the investigator explained the study objectives, the data collection processes, and the subjects' right to participate in this study (Appendix A).

4. All data were collected in early evening to accommodate subject and unit routines. All subjects performed the interventions 1 hour after meals, voided, and were cleared airway before beginning the interventions.

5. The investigator interviewed the subjects about information related to demographic data, relaxation techniques and music preferences data after they had agreed to participate.

6. All subjects were educated to breath correctly in order to measure VC accurately. They were instructed to breath by using voluntary effort to inhale as deeply as possible and exhale as completely as possible.

7. All thirty subjects were randomly assigned to receive either music therapy or no music therapy first. This study used change – over design, in which each subjects served as their own control. All subjects received both music therapy in the experimental period and no music therapy in the control period.

For example: if the first subject was randomly assigned initially to the experimental period by tossing a coin, the next day of this subject would be in the control period. Following subjects would be randomly assigned to receive intervention in the same way as the first subject.

Experimental Period

The subjects received instructions for music therapy during receiving mechanical ventilation according to the following steps:

1. Approaching and describing the objective, methodology and procedures of this research to the subjects.

2. Assessment of the subjects' music preference and the details were interviewed and recorded in the questionnaire before starting the intervention.

3. Anxiety score and VC were measured and recorded before treatment by operating subjects in fowler's position.

4. The subjects were given a choice of four compact disks from the investigator's collection. The subjects were instructed to lie with the most comfortable position and to concentrate on the flow of the music with their eyes closed.

5. The subjects listened to the chosen compact disk through headphones via portable compact disk player for 30 minutes. The environment was enhanced to promote rest by closing the curtain, dimming the lights, and posting a Please Do Not Disturb outside each subject's bed. The investigator remained with the subject for purpose of recording the physiological measures.

6. The physiologic variables of heart rate, respiratory rate, and oxygen saturation were measured as baseline at 5 minutes before intervention was started, every 5 minutes during the assigned treatment condition, and at 5 minutes after the intervention. Blood pressure was measured in the same way except during the assigned treatment condition which were measured at every 10 minutes. Heart rate, blood pressure, and oxygen saturation were recorded from portable bedside monitoring with full option (Envoy Monitoring System- Model EN0282).

7. Anxiety score and VC were measured again after each intervention session.

8. The control period had back ground of their environment, as heard through silent headphones, was identical in length to the music period. All procedures and measurements were similar to the experimental period.

Data Analysis

All data was analyzed by using SPSS 9 for Windows program:

1. The demographic and clinical characteristic data were reported by descriptive statistics: number, percentage, range, mean, and standard deviation.

2. The music therapy assessment and open-end satisfaction were reported by descriptive statistics: number, percentage, and mean.

3. Paired t-test was used for comparing the anxiety levels, heart rate, respiratory rate, systolic and diastolic blood pressure, VC, and oxygen saturation between music therapy period and without music therapy period.

CHAPTER IV

RESULTS

This study was experimental research to test the effectiveness of music therapy in increase relaxation by reduction of anxiety, improving physiologic response,VC and oxygen saturation in mechanically ventilated patients. In this chapter the results of the data analysis are presented in two parts; the descriptive data of the study population and the result for hypothesis testing.

Characteristic of the Population

The total population of this study consisted of 46 mechanically ventilated patients who were approached by the investigator. Sixteen patients were excluded from analysis for the following reasons: 4 subjects died after the instrument administration, 4 subjects withdrew at various time during the assigned treatment condition. reason given for withdrawal were personal (i.e., worried about illness, tired of lying still), 8 subjects had fever and came to stage of shock during the assigned treatment condition. Therefore, the completed subjects for this study consisted of 30 mechanically ventilated patients. Among the 30 subjects, 11 (36.7%) were male and 19 (63.3%) were female, ranging in age from 18-70 with an average of 46.73 years of age. The majority of the subjects were married (70%), had education back ground in high school and undergraduate level (33.33%), were unemployed

(30.30%) and had a family income with an average of 10,000 - 20,000 Bath per month (33.34%). These general characteristics of the population were summarized in Table 1.

Table1 Population characteristics, number and percentage (n=30).

Characteristics	Number	Percent
Sex		
Male	11	36.70
Female	19	63.30
Age		
< 30 years	6	20.00
31-40 years	4	13.33
41-50 years	8	26.67
51-60 years	6	20.00
61-70 years	6	20.00
Range 18-70 Mean 46.73 SD 14.76		
Marital Status		
Single	5	16.70
Married	21	70.00
Widowed	4	13.30
Religion		
Buddhism	30	100.00
Other	0	0.00
Hometown		
Bangkok	22	73.30
Other Provincial	8	26.70
Education background		
Pratom	9	30.00
Mattayom	10	33.33
Bachelor	10	33.33
Master	1	3.34

Table 1 (continued)

Characteristics	Number	Percent
Occupation		
Business	3	10.00
Government official	8	26.67
Employee	8	26.67
Unemployed	9	30.00
Student	2	6.66
Hospital payment		
Themselves	13	43.33
Government insurance	14	46.67
Social service	3	10.00
Family Income		
<10,000	6	20.00
10,000-20,000	10	33.33
20,001-30,000	6	20.00
30,001-40,000	1	3.34
40,001-50,000	3	10.00
> 50,000	4	13.33

Data related to disease, treatment, and relaxation techniques

Respiratory problems were the most cause of respiratory failure (n=15).Other causes were cardiac problem, neuromuscular problem, renal problem, and infection. The majority had underlying disease (n=27) and the major cause of underlying disease were respiratory system (n=12) and cardiovascular system (n=16).

Subjects had been requiring mechanical ventilation for an average of 9.6days at study entry, with a range from 1 to 62 days. Length of admission ranged from 1-47 days. The most common mode was with continuous mandatory ventilation (60%) and the most type of intubation was oral (86.7%). About half (56.7%) had no complication and the remainder (43.3%) had pneumonia. Twenty-three subjects used antibiotics during the admission.

Out of the 30 subjects, one-fifth (n=6) received a sedative medication before intervention randomization. The most common sedative medication administered to these 6 subjects was a lorazepam (66.67%) followed by diazepam (33.33%). All subjects reported that the most previous or current use of relaxation techniques were music (25.89%) and watching television (23.52%)(Table 2).

Table 2 Characteristics of disease, respiratory treatment, relaxation techniques, number and percentage (n=30).

Characteristics	Number	Percent
Causes of respiratory failure		
Respiratory problem		
Acute respiratory distress syndrome	3	10.00
Asthma attack	1	3.33
Bronchitis	1	3.33
Chronic obstructive pulmonary disease	2	6.67
Alveolar proteinosis	1	3.33
Pneumonia	3	10.00
Pulmonary edema	4	13.34

Table 2 (continued)

Characteristics	Number	Percent
Cardiac problem		
Congestive heart failure	6	20.00
Peripartum cardiomyopathy	1	3.33
Digoxin intoxication	1	3.33
Neuromuscular problem		
Guillain-Barre' Syndrome	1	3.33
Myasthnia Gravis	1	3.33
Proximal muscle weakness	1	3.33
Tetanus	1	3.33
Renal problem		
Acute renal failure	1	3.33
Infection		
Sepsis	2	6.67
Underlying disease		
No	3	10.00
Yes	27	90.00
Respiratory system	12	21.02
Cardiovascular system	16	28.07
Immune system	5	8.87
Cancer	2	3.51
Hematologic system	8	14.04
Neurologic system	2	3.51
Endocrine system	6	10.53
Renal	6	10.53
Length of admission (day)		
Range 1-47 Mean 8.60 SD 11.56		
Length of ventilation (day)*		
Range 1-62 Mean 9.63 SD 15.42		

Table 2 (continued)

Characteristics	Number	Percent
Type of intubation		
Oral	26	86.70
Tracheostomy	4	13.30
Type of ventilation		
Benett 7200	19	63.30
MAI	11	36.70
Mode of ventilation		
CMV	18	60.00
SIMV	4	13.33
PCV	4	13.33
CPAP	4	13.33
Sedative or muscle relaxation		
No use	24	80.00
Use	6	20.00
Lorazepam	4	66.67
Diazepam	2	33.33
Antibiotic		
No use	7	23.30
Use	23	76.70
Complication		
No	13	43.30
Yes	17	56.70
Pneumonia	17	100.00

*** 1 case has been on mechanical ventilator at home**

Table 2 (continued)

Characteristics	Number	Percent
Relaxation techniques		
Housework	5	5.89
Watching television	20	23.52
Music	22	25.89
Sports	7	8.23
Prayer	5	5.89
Reading	11	12.94
Pet	6	7.05
Gardening	5	5.89
Sight seeing	4	4.70

Results of Hypothesis testing

1. Hypothesis 1 stated that " During receiving music therapy period (experimental period), there will be greater significant decrease in anxiety level than during without music therapy period (control period)."

In this study, the posttest mean anxiety score of the patients who received music therapy was 4.87, whereas that of the patients without music therapy was 6.80 (Table 3).From the paired t-test, the anxiety score in the music therapy period was 2.63, whereas that in the control period was 0.53 (Table 4). We can see from two tables that the decreasing in anxiety level of the patients receiving music therapy was significantly greater than in the control period, hence the results supported Hypothesis 1.

Table 3 Pretest and posttest mean scores on anxiety level (n=30).

	Pretest		Posttest	
Period	M	SD	M	SD
No music	7.33	1.42	6.80	1.27
Music	7.50	1.50	4.87	1.04

Table 4 Comparison of the mean change in decreasing of anxiety score between music therapy period and control period (n=30).

Period	Anxiety Scores			
	M	SD	t-value	p-value
No music	0.53	0.51	11.99	.000
Music	2.63	0.99		

2. Hypothesis 2 stated that " During receiving music therapy period (experimental period), there will be greater significant increase in Vital capacity (VC) than that during no music therapy period (control period).

In this study, the posttest mean VC score of the patients who received music therapy was 750.67, whereas that of the patients without music therapy was 564.67 (Table 5).From the paired t-test, the VC score in the music therapy period was 180.67, whereas that in the control period was 17.67(Table 6). We can see from two tables that

the increasing in VC level of the patients receiving music therapy was significantly greater than in the control period, hence the results supported Hypothesis 2.

Table 5 Pretest and posttest mean scores on VC level (n=30).

	Pretest		Posttest	
Period	M	SD	M	SD
No music	547.00	111.64	564.67	120.48
Music	570.00	120.11	750.67	159.70

Table 6 Comparison of the mean change in increasing of VC level between music therapy period and control period (n=30).

Period	VC Scores			
	M	SD	t-value	p-value
No music	17.67	39.36	11.135	.000
Music	180.67	65.54		

3. Hypothesis 3 stated that " During receiving music therapy period (experimental period), there will be greater significant decrease in heart rate than that during no music therapy period (control period)."

In this study, the posttest mean heart rate of the patients who received music therapy were lower than that of the patients without music therapy over time

(Table 7). From the paired t-test, showed the greater decreasing of mean heart rate at the first 15 minutes. The mean change of heart rate in the music therapy period at the first 15 minutes was 5.30, whereas that in the control period was 2.33(Table 8). We can see from two tables that the decreasing in mean heart rate of the patients receiving music therapy was significantly greater than in the control period, hence the results supported Hypothesis 3.

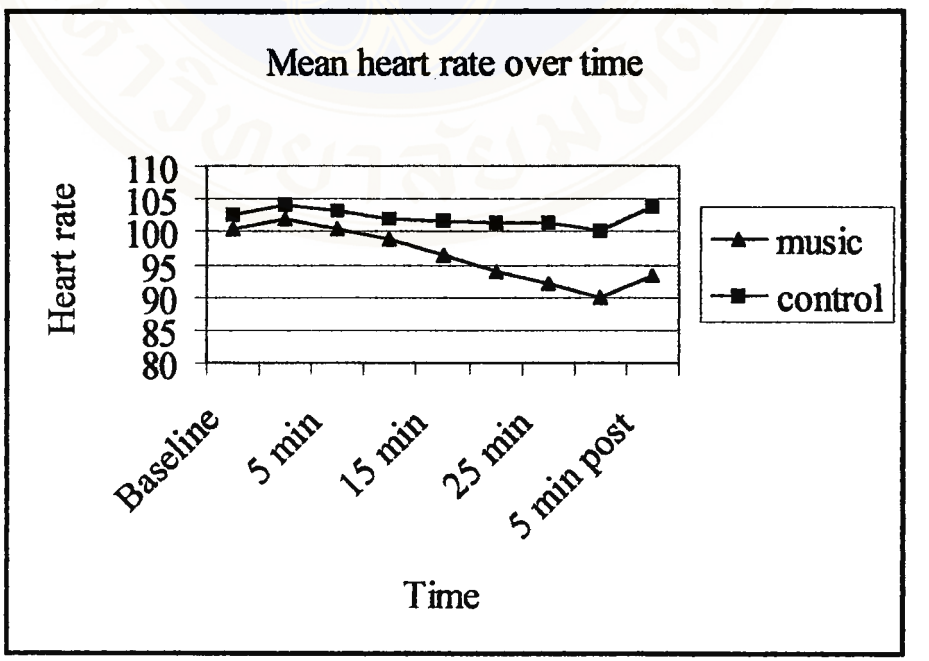
Table 7 Mean heart rate over time between music therapy period and control period (n=30).

Time	Control Period		Music therapy Period	
	M	SD	M	SD
Base line	102.70	18.78	100.40	19.86
Begin	104.07	18.18	101.77	20.26
5 min	103.10	19.38	100.50	20.43
10 min	102.07	18.82	98.87	20.96
15 min	101.73	18.60	96.47	20.02
20 min	101.20	18.28	93.87	19.99
25 min	101.47	18.60	91.93	19.09
30 min	100.23	17.96	89.97	18.89
5 min post	102.70	18.32	93.10	19.66

Table 8 Comparison of the mean change in decreasing of heart rate over time between music therapy period and control period (n=30).

Time interval	Control Period		Music therapy Period			
	M	SD	M	SD	t-value	p-value
Begin-5 min	0.97	2.19	1.27	2.50	.616	.543
Begin-10 min	2.00	1.74	2.90	2.59	1.943	.062
Begin-15 min	2.33	2.54	5.30	3.21	3.982	.000
Begin-20 min	2.87	2.92	7.90	3.91	7.007	.000
Begin-25 min	2.60	3.15	9.83	4.79	6.991	.000
Begin-30 min	3.83	2.67	11.80	4.57	9.058	.000

Figure 2 Mean heart rate over time.



From Table 8 and Figure 2, the results showed the significant time effects of music therapy period on heart rate. This interaction effect indicated

that the relaxation response occurred within the first 15 minutes (from the baseline to the first15 minutes) and continued for the remainder of the experimental period.

4 Hypothesis 4 stated that "During receiving music therapy period (experimental period), there will be greater significant decrease in respiratory rate than that during no music therapy period (control period)

In this study, the posttest mean respiratory rate of the patients who received music therapy were lower than that of the patients without music therapy over time (Table 9). From the paired t-test, showed the greater decreasing of mean respiratory rate at the first 15 minutes. The mean change of respiratory rate in the music therapy period at the first 15 minutes was 3.13, whereas that in the control period was1.47 (Table10).We can see from two tables that the decreasing in mean respiratory rate of the patients receiving music therapy was significantly greater than in the control period, hence the results supported Hypothesis 4.

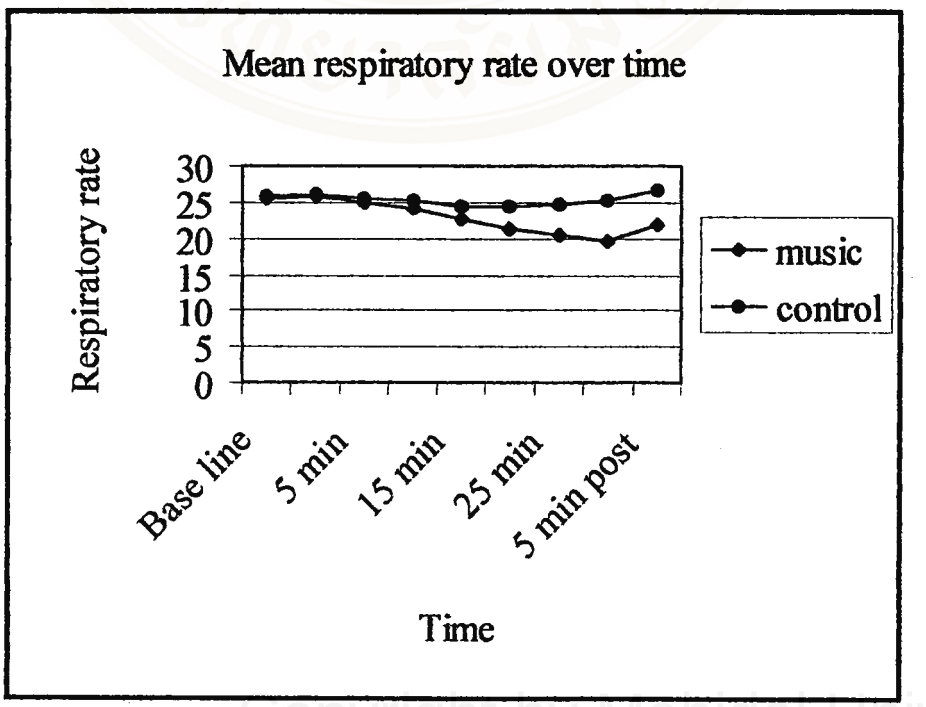
Table 9 Mean respiratory rate over time between music therapy period and control period (n=30).

Time	Control Period		Music therapy Period	
	M	SD	M	SD
Base line	25.73	2.56	25.47	2.87
Begin	26.00	3.28	25.77	3.21
5 min	25.57	3.62	25.00	3.97
10 min	25.10	3.02	24.00	3.60
15 min	24.53	2.96	22.63	2.92
20 min	24.43	2.75	21.43	3.00
25 min	24.70	2.74	20.40	2.98
30 min	25.17	2.70	19.67	2.73
5 min post	25.73	2.41	21.90	2.58

Table 10 Comparison of the mean change in decreasing of respiratory rate over time between music therapy period and control period (n=30).

Time interval	Control Period		Music therapy Period			
	M	SD	M	SD	t-value	p-value
Begin-5 min	0.43	1.61	0.77	1.94	.757	.455
Begin-10 min	0.90	1.90	1.77	1.83	1.766	.088
Begin-15 min	1.47	2.30	3.13	2.05	3.579	.001
Begin-20 min	1.57	2.54	4.33	2.20	5.342	.000
Begin-25 min	1.30	2.51	5.37	2.26	7.094	.000
Begin-30 min	0.83	2.10	6.10	2.29	10.072	.000

Figure3 Mean respiratory rate over time.



From Table 10 and Figure 3, the results showed significant time effects of music therapy period on respiratory rate. This interaction effect indicated that the relaxation response occurred within the first 15 minutes (from the baseline to the first 15 minutes) and continued for the remainder of the experimental period

5. Hypothesis 5 stated that " During receiving music therapy period (experimental period), there will be greater significant decreasing in blood pressure than that during no music therapy period (control period)."

In this study, the posttest mean systolic, mean arterial pressure, and diastolic blood pressure of the patients who received music therapy were lower than that of the patients without music therapy over time (Table 11). From the paired t-test, showed the greater decreasing of mean systolic blood pressure at the first 10 minutes and mean arterial pressure at 30 minutes but no difference in mean diastolic blood pressure over time. The mean change of systolic blood pressure in the music therapy period at the first 10 minutes was 3.97, whereas that in the control period was1.50. The mean change of mean arterial pressure in the music therapy at 30 minutes was 5.92, whereas that in the control period was 1.80 (Table12).We can see from two tables that the decreasing in mean systolic blood pressure and mean arterial pressure of the patients receiving music therapy were significantly greater than in the control period but no significant differences in mean diastolic blood pressure, hence the results partially supported Hypothesis 5.

Table 11 Mean systolic, diastolic blood pressure, and mean arterial pressure over time between music therapy period and control period (n=30).

Variables and time	Control Period		Music therapy Period	
	M	SD	M	SD
Systolic blood pressure				
Baseline	129.40	11.69	126.67	13.77
Begin	129.57	11.62	127.07	14.69
10 min	128.07	12.06	123.10	14.96
20 min	127.00	11.42	120.00	13.56
30 min	128.00	12.25	117.60	13.41
5 min post	126.57	24.33	122.03	13.28
Diastolic blood pressure				
Baseline	77.83	5.66	73.80	9.65
Begin	76.03	5.81	73.27	9.30
10 min	74.40	6.31	71.47	8.47
20 min	73.73	5.73	70.43	8.08
30 min	74.10	5.57	69.13	9.84
5 min post	75.50	5.39	71.87	8.5
Mean arterial pressure				
Base line	94.99	6.94	91.25	10.32
Begin	93.48	7.25	91.17	10.13
10 min	92.26	7.61	88.64	9.86
20 min	91.41	7.15	86.82	9.02
30 min	92.04	6.98	85.26	10.13
5 min post	93.72	6.59	88.72	9.26

Table 12 Comparison of the mean changes in decreasing of systolic, diastolic blood pressure, and mean arterial pressure between music therapy period and control period (n=30).

Variables and time	Control Period M	Control Period SD	Music therapy Period M	Music therapy Period SD	t-value	p-value
Systolic blood pressure						
Begin-10 min	1.50	4.14	3.97	2.98	-2.371	.025
Begin-20 min	2.57	4.38	7.07	5.11	-3.543	.001
Begin-30 min	1.50	3.64	10.21	3.08	-10.182	.000
Diastolic blood pressure						
Begin-10 min	1.63	3.07	1.80	4.77	-0.149	.882
Begin-20 min	2.30	3.52	2.83	4.36	-0.464	.646
Begin-30 min	1.93	4.40	4.13	5.12	-1.504	.143
Mean arterial pressure						
Begin-10 min	1.58	2.94	2.53	3.44	1.04	.309
Begin-20 min	2.42	3.04	4.35	3.87	1.91	.067
Begin-30 min	1.80	3.67	5.92	3.92	3.64	.001

Figure 4 Mean systolic blood pressure over time.

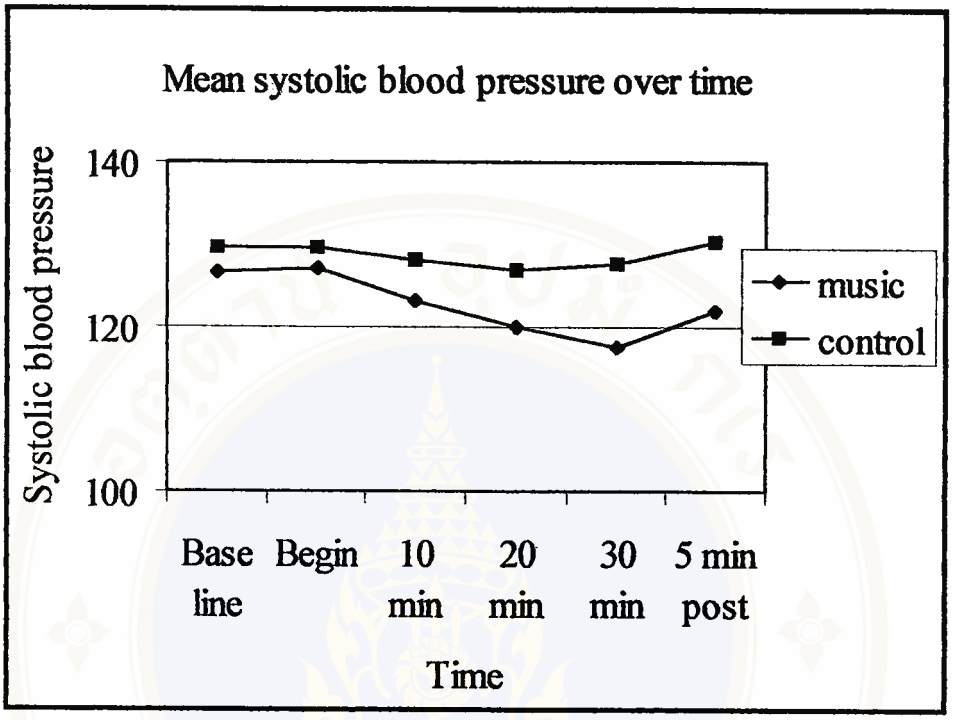


Figure 5 Mean arterial pressure over time

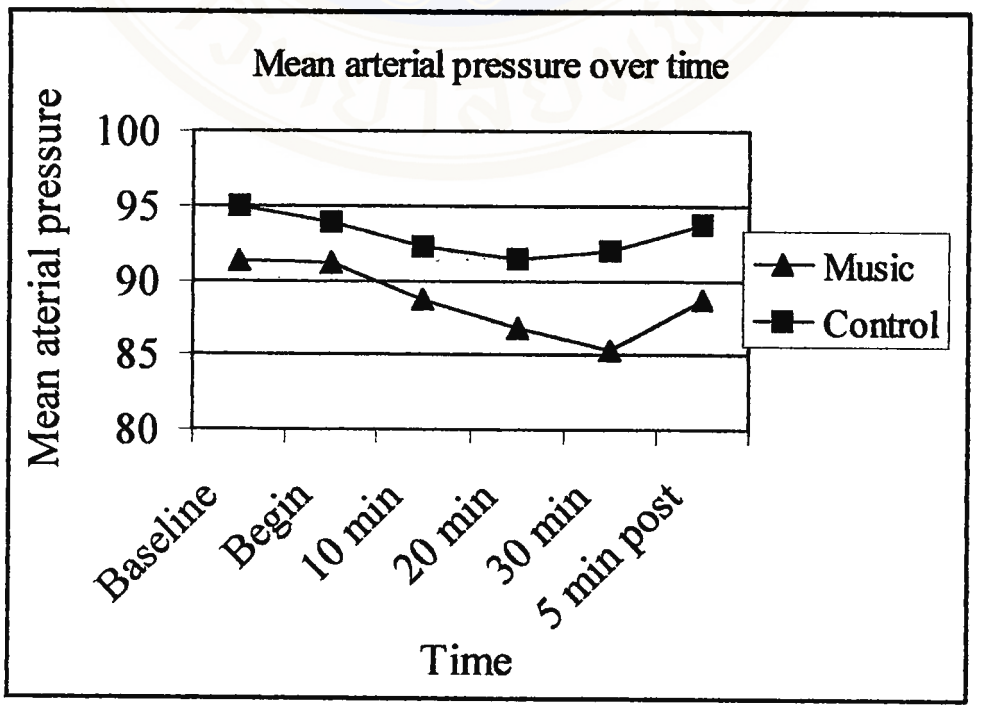
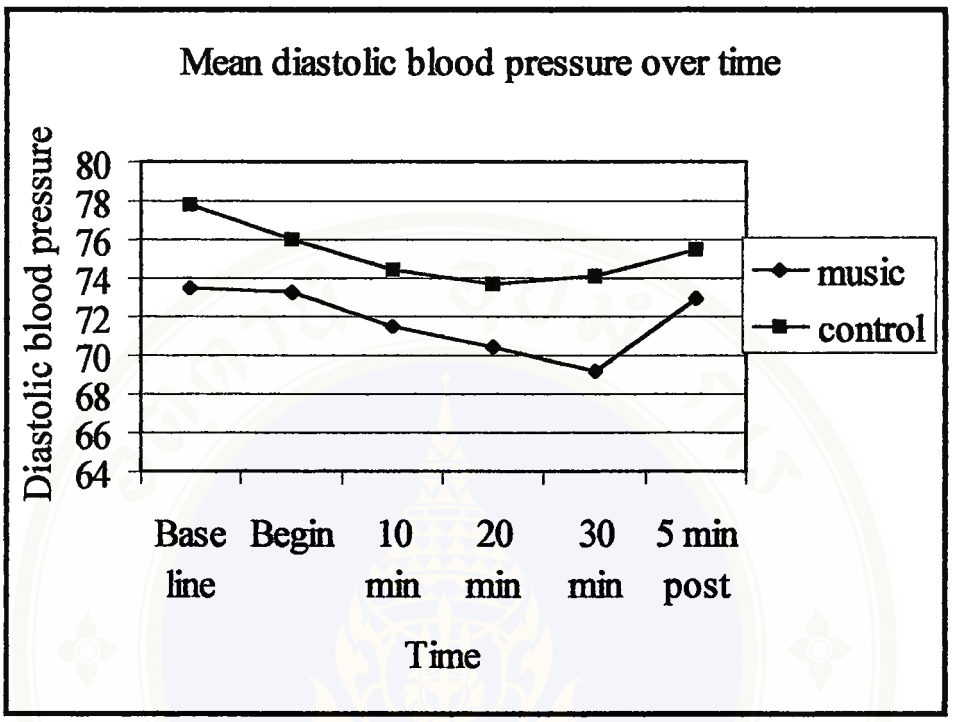


Figure 6 Mean diastolic blood pressure over time.



From Table 12, Figure4, and Figure5, the results showed the significant time effects of music therapy period on systolic blood pressure and mean arterial pressure. This interaction indicated that the relaxation response on systolic blood pressure occurred within the first 10 minutes (from the baseline to the first 10 minutes) and continued for the remainder of the experimental period. The relaxation response on mean arterial pressure occurred within 30 minutes.

6. Hypothesis 6 stated that " During receiving music therapy period (experimental period), there will be greater significant increase in oxygen saturation than that during no music therapy period (control period)."

In this study, the posttest mean oxygen saturation of the patients who received music therapy were higher than that of the patients without music therapy (Table 13). From the paired t-test, showed the greater increasing of mean oxygen saturation at the first 5 minutes. The mean change of oxygen saturation in the music therapy period at the first 5 minutes was a increase of 0.53, whereas that in the control period was a decrease of 0.17(Table14).We can see from two tables that the increasing in mean oxygen saturation of the patients receiving music therapy was significantly greater than in the control period, hence the results supported Hypothesis 6.

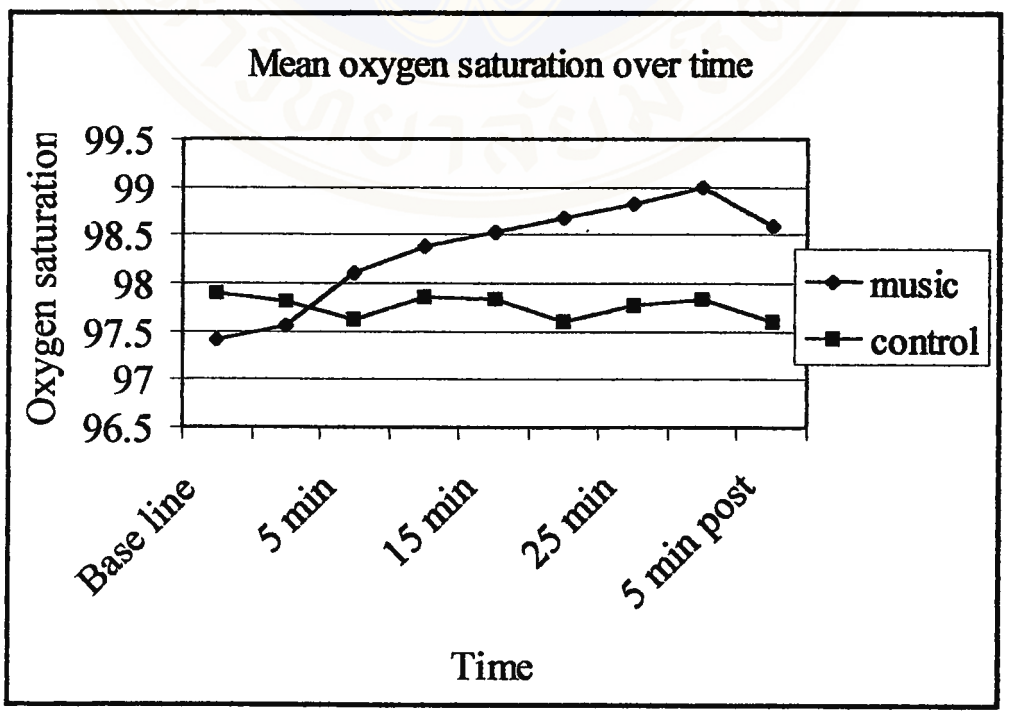
Table 13 Mean oxygen saturation over time between music therapy period and control period (n=30).

Time	Control Period		Music therapy Period	
	M	SD	M	SD
Baseline	97.90	1.37	97.43	1.52
Begin	97.80	1.27	97.57	1.57
5 min	97.63	1.16	98.10	1.56
10 min	97.87	1.72	98.37	1.56
15 min	97.83	1.56	98.53	1.76
20 min	97.60	1.61	98.67	1.58
25 min	97.77	1.59	98.83	1.34
30 min	97.83	1.39	99.00	1.41
5 min post	97.60	1.33	98.60	1.35

Table 14 Comparison of the mean change in increasing of oxygen saturation between music therapy period and control period (n=30).

Time interval	Control Period		Music therapy Period			
	M	SD	M	SD	t-value	p-value
Begin-5 min	- 0.17	0.83	0.53	0.68	3.252	.003
Begin-10 min	0.07	1.11	0.80	0.66	3.791	.001
Begin-15 min	0.03	0.93	0.97	0.96	4.065	.000
Begin-20 min	-0.20	0.85	1.10	0.99	3.657	.000
Begin-25 min	-0.03	1.19	1.27	0.87	4.573	.000
Begin-30 min	0.03	0.77	1.43	0.94	6.433	.000

Figure 7 Mean oxygen saturation over time.



From Table 14 and Figure7, the results showed the significant time effects of music therapy period on oxygen saturation. This interaction indicated that the relaxation response occurred within the first 5 minutes (from the baseline to the first 5 minutes) and continued for the remainder of the experimental period.

To compare pretest and posttest variables for both periods in within-group in order to show the effectiveness of each treatment condition, paired t-test was used. Pre test score and posttest score at 30 minutes, which were the beginning and the end of treatment were selected for comparison of physiological responses and oxygen saturation. As showed in Table15, patients in music therapy demonstrated a significant decrease from pretest to posttest anxiety score and significant increase from pretest to posttest VC score. Patients in music therapy also demonstrated a significant decrease from the beginning to 30 minutes of intervention in heart rate, respiratory rate, systolic,diastolic, and mean arterial blood pressure, and significant increase from the beginning to 30 minutes of intervention in oxygen saturation (Table 16).

As showed in Table17, patients in without music therapy period demonstrated a significant decrease from pretest to posttest anxiety score and significant increase from pretest to posttest VC score. Patients in without music therapy also demonstrated a significant decrease from the beginning to 30 minutes of intervention in heart rate, respiratory rate, and systolic and diastolic pressure, but no significant increase from the beginning to 30 minutes of intervention in oxygen saturation (Table 18).

Table 15 Comparison of mean anxiety and vital capacity between pretest and posttest of music therapy period (n=30).

Variables	Pretest		Posttest			
	M	SD	M	SD	t-value	p-value
Anxiety levels	7.50	1.50	4.87	1.04	14.43	.000
Vital capacity	570.00	120.11	750.67	159.70	-15.09	.000

Table 16 Comparison of mean heart rate, respiratory rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation between the beginning and at 30 minutes of music therapy period (n=30).

Variables	Begin		30 minutes			
	M	SD	M	SD	t-value	p-value
Heart rate	101.77	20.26	89.97	18.89	14.15	.000
Respiratory rate	25.77	3.21	19.67	2.73	14.56	.000
Systolic blood pressure	127.07	14.69	117.60	13.41	11.76	.000
Diastolic blood pressure	73.27	9.30	69.13	9.84	4.42	.000
Mean arterial pressure	91.17	10.13	85.26	10.13	8.26	.000
Oxygen saturation	97.57	1.57	99.00	1.41	-8.40	.000

Table 17 Comparison of mean anxiety and vital capacity level between pretest and posttest of without music therapy period (n=30).

Variables	Pretest		Posttest			
	M	SD	M	SD	t-value	p-value
Anxiety levels	7.33	1.42	6.80	1.27	5.76	.000
Vital capacity	547.00	111.64	564.67	120.48	-2.46	.020

Table 18 Comparison of mean heart rate, respiratory rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation between the beginning and at 30 minutes of without music therapy period (n=30).

Variables	Begin		30 minutes			
	M	SD	M	SD	t-value	p-value
Heart rate	104.07	18.81	100.23	17.96	7.88	.000
Respiratory rate	26.00	3.28	25.17	2.70	2.17	.038
Systolic blood pressure	129.57	11.62	128.00	12.25	2.26	.032
Diastolic blood pressure	76.03	5.81	74.10	5.57	2.41	.023
Mean arterial pressure	93.84	7.25	92.04	6.98	2.68	.012
Oxygen saturation	97.80	1.27	97.83	1.39	-0.24	.813

In this study, all thirty patients interested in music and liked to listen to music collection. The significance of music in their life were ranged from 4-9 with an average of 6.9. Sea sounds (39.28%) and Songbirds sounds (35.72%) were the most favorite sounds in this study. The subjects satisfaction with the use of music therapy for 30 minutes, while receiving mechanical ventilator, was reflected in the results, which showed that the majority of satisfaction levels in 18 subjects were high (60%) (See Table19).

Table 19 Satisfaction level for using music therapy during receiving mechanical ventilator.

Satisfaction level	Number (N=30)	Percent
High	18	60.0
Middle	11	36.7
Low	1	3.3

The advantage of using music therapy while receiving mechanical ventilator was presented in number and percentage. While using music therapy the data showed that the most significant advantages were reduce anxiety, fear, and suffering (70%), reduce perception of pain (50%), promote sleep and rest (43.3%), promote relaxation (40%), feel enjoy (30%), promote comfort (26.7%), feel calm (26.7%), being with the natural (23.3%), reduce the shortness of breath (13.3%). All data is presented in Table 20.

Table 20 The number and percentage of the advantages of using music therapy perceived by the patients (n=30).

Advantages of using music therapy	Number	Percent
Reduce anxiety, fear, and suffering	21	70.0
Reduce perception of pain	15	50.0
Promote sleep and rest	13	43.3
Relaxation	12	40.0
Enjoy	9	30.0
Promote comfort	8	26.7
Calm	8	26.7
Being with the natural	7	23.3
Reduce the shortness of breath	4	13.3

* **One patient could answer for more than one advantage.**

CHAPTER V

DISCUSSION

Results of this study indicated the effectiveness of music therapy on anxiety, physiological responses,VC, and oxygen saturation. The results can be discussed as follows:

Subjects

From these data, it was pointed that respiratory problems were the major cause of respiratory failure. Patients were admitted to the critical care unit and used a mechanical ventilator for life-saving. Most of patients had underlying diseases which increased severity of their critical illness. Length of time of admission (mean=8.60 day) equally to length of ventilation (mean=9.63 day) indicated that patients confronted with impact of hospitalization and ventilation for a long times. These resulted in induced pneumonia (100%) as complication from mechanical ventilation and seventy percents of the patients used antibiotics for treatments. These may caused patients to spend high cost and time in critical care unit, which may result in financial problem, delay recovery, and delay weaning. All patients had their own relaxation techniques to relieve their anxiety that are easy to initiate by themselves. Music, watching television, and reading were the favorite relaxation techniques used by the mechanically ventilated patients.

Effectiveness of Music Therapy on Anxiety, Physiological responses and Vital capacity

These research results supported the five hypothesis and partially supported one hypothesis that during receiving music therapy period, the mechanically ventilated patients had greater significant decrease in anxiety level, heart rate, respiratory rate, and systolic and mean arterial blood pressure and also greater significant increase in VC and oxygen saturation than that during no music therapy period. The results can be explained as follow:

After hospitalization, the respiratory failure patients were admitted in critical care unit and required mechanical ventilation for life- saving. Patients were confronted with many stressors including admission, nature of the illness, critical care environment, process of ventilator, physical impairment, dependence on ventilation, communication impairment. These several factors increase patients' anxiety. Patients might be in a state of disequilibrium caused by anxiety. The physiological response was that of sympathetic arousal, that was, increased circulation of cathecholamine, increased heart rate, increased respiratory rate, increased blood pressure, increased muscle tension (Mazzeo, 1995:94).

After music listening, music therapy exerted its effect on relaxation by synchronizing of the patients' body rhythm with music's relaxing rhythm. Music affected central nervous system, and evoked psychophysiological response on the limbic system, the center of emotions, feeling, and sensation (Guzzetta, 1995:672). The limbic system was involved in sensations of reward, punishment, pleasure, and pain (Thaut, 1990:15). Neural impulses produced by

music provided an directly reward experience by releasing of endorphins. Music changed moods including anxiety by stimulating an unconscious response at limbic and conducted muscle relaxation response. Limbic system had connection with the cerebral cortex for transmission of emotional influences which responded in relaxation and anxiety reduction (Pender, 1982:237). When patients relaxed, limbic transmitted impulse automatically to hypothalamus. Hypothalamus were diminished activity and affected releasing of CRH. Then, sympathetic nervous system activity were decreased, resulting in a dampening in the arousability of the central nervous system (Everly & Benson, 1989:18). These responses, in turn, lead to decreased adrenergic activity, altered states of conciousness, and decreased neuromuscular arousal. They were manifested as physiological indicators of relaxation response by decreased in heart rate respiratory rate, oxygen consumption, muscle tension, epinephrine level, and blood pressure (Everly & Benson, 1989:18; Zahourek, 1988:11)

The results of this study is consistent with other findings of decreased post treatment state anxiety in response to music intervention in critically ill patients (Chlan,1998:174; Lueders Bolwerk, 1990:45; Standley, 1986: 104; Stone et al., 1989: 291; White, 1989:61). The results of this study on physiological variables are consistent with findings showing that music therapy is effective in decreasing heart rate (Bonny, 1983:10; Chlan, 1995:235; Chlan, 1998: 174; Guzzetta, 1989:611; Updike, 1990:41; White, 1992:60), respiratory rate (Barnason et al.,1995:124;Chlan, 1995:235; Chlan, 1998:174; White, 1992:61), and systolic blood pressure and mean arterial pressure (Barnason et at., 1995:124; Updike, 1990: 40; Updike & Charles, 1987: 32; White, 1992:60; Zimmerman et al., 1988: 563).

In this study, the mean diastolic blood pressure in both periods were not significantly different. This result is similar to the study of Augustin and Hains (1996) who found no significant difference in mean diastolic blood pressure between preoperative surgery patients who received music with preoperative instruction and received only preoperative instruction. Another research found similar result of no difference in mean diastolic blood pressure between outpatients awaiting arthroscopic procedures who received sedative music and not exposed to music. In this finding, within-period analysis, patients in both periods showed significant decrease from pretest to posttest in mean diastolic pressure. It may be explained that patients in both periods were relaxed but variability of systolic blood pressure were greater than diastolic blood pressure. Systolic blood pressure varied to emotional response of individual which were under the influence of the autonomic nervous system (Conway, 1986:262; Gordon et al., 1976:327).

Anxiety and physiological responses from relaxation related to pulmonary function. Significance for a decrease in anxiety and improve in physiological response indicated that music therapy facilitated relaxation and help individuals to maintain muscle movement (Guzzetta, 1997:198; Snyder & Chlan, 1999). Anxiety reduction and muscle relaxation would promote the patients' respiratory muscle strength. VC itself is now accepted as the best bedside monitor of respiratory muscle function (Lumb, 2000:134). Increasing in VC were produced by the full activation of the relaxed respiratory muscles. According to the literature review, there was no specific research of music therapy for improving VC. Study related to VC was started by Lehrer et al(1994) to test the effectiveness of relaxation , music therapy, and an wait-list period on methacholine test and pulmonary function test in 72 asthmatic patients.

The results found that there was greater perceived relaxation in the music and relaxation groups than in the control group and there were no difference in spirometry found between groups.

Anxiety reduction and improvement of physiological responses and VC were associated with a decrease in oxygen consumption. The decreasing of sympathetic activity responses caused an decrease in vasoconstriction of arteries, and resulted in decreased oxygen consumption and increased in oxygen delivery to the vital organs (Mazzeo, 1995:942). Increasing in VC could also improve oxygenation. Improving VC by decreasing respiratory muscle tension improved patients' ventilation and gas exchange. Thus, anxiety reduction, improvement of physiological response, and VC facilitated oxygenation improvement which showed by increasing patients' arterial blood saturation. Findings from this study on oxygen saturation is congruent with the study by Collins & Kuck (1991), who explored the effects of combined womb sounds and synthesized female vocals. Various measurements were recorded every two minutes for a period of 20 minutes. Music was played during the second 10 minutes. There was statistically significant increasing in level of oxygen saturation. Another study (Leonard,1993), reported on the positive effects of using the same music for increasing levels of oxygen saturation in three brief case studies.

According to the patients in music therapy period, music helped them relax, reduced their anxiety levels, and improved physiological responses. It showed that music therapy functioned as a distracter by shielding the patients from unpleasant sensations in critical care unit such as noisy environment and the continuously

procedures (Baker, 1992:75). These responses to music showed that patients were interested in music therapy and enjoyed to choice of music listening. These responses to music also confirm the previous research findings that music is interesting and also is a patient satisfies (Heitz et.al., 1992:24; Locsin, 1981:21).

The other finding of this study was in relation to response of patients to headphones. Using of headphones in the critical care setting may offer mechanically ventilated patients a dimension of personalization when they are unaware of other caring communication and action by providers by blocking out extraneous, annoying noise in the critical care environment (Byers, 1997: 42; Chlan, 1995:235). Although result in this study showed greater significant decrease in anxiety in music therapy period than no music therapy period, but the analysis within group showed significant decrease from pretest to posttest anxiety levels and another variables in both periods. When compared to previous research in critical care setting, the use of headphone may be significant. Four researches found a reduction in anxiety for patients listening to music through headphones (Chlan, 1998: 174; Heiser et al., 1997:780; Steelman, 1990: 1030; Zimmerman et al., 1988: 564). Another research found no difference in anxiety between those receiving music without headphones and those receiving no music (Kaempf, 1989:115). These results in this study may suggest that using headphones and uninterruped rest condition in this study adequately reduces most patients' anxiety in critical care unit.

The collection of music using in this study were natural music. These music were not conducted to test the validity because they were produced aboard. The results

from this study can verify that these natural music were effective in decrease anxiety and promote relaxation.

The results of this study showed that there were statistical significance for using music therapy for decreasing anxiety, promoting relaxation, and improving VC and oxygen saturation. These results support the conceptual framework which has proposed the interrelationship of body and mind in an ever-changing environment (Dossey et. al., 1995:138). Thus, these findings demonstrate the strength of music therapy as an independent nursing intervention that focus on the whole person.

This experimental research was studied in a small group of subjects (consisting of thirty respiratory failure patients), which may reduce the power of the analysis test (Berns & Grove, 1987:482-83). However, the results of this study indicated that there was statistical significance for using music therapy in the mechanically ventilated patients. Therefore, if considered from the experimental perspective of using change over design, which allows self-control, and controlling the consistency of disease and treatment. Consequently, the results of the study confirm that music therapy can effectively reduce anxiety and promote relaxation in patients receiving mechanical ventilator by shielding the patients from unpleasant sensation, inhibiting patients' anxious reaction, and providing an reward experience through the activation of brain reward center.

Patient Satisfaction

The majority of patients had a high satisfaction level with the use of music therapy. The patients described advantages of music therapy which include reduce anxiety, fear, suffering, perception of pain, and the shortness of breath, promote sleep and rest, relaxation, comfort, and facilitate feeling of enjoyment, calmness, and naturalness. Moreover, they suggested that the application of music therapy was convenient, low-priced, and nonthreatening. There was some discomfort in wearing headphones while they were listening to music. In addition, it was found that some patients were interested in using natural music continuously while receiving mechanical ventilation for promoting relaxation by themselves.

The investigator would like to suggest that nurses can facilitate music therapy as a nonpharmacologic care to the mechanically ventilated patients. Because of the passiveness of listening to music, music therapy may be an ideal intervention for critically ill patients with low energy states. It can help them in dealing with the environment and in coping with the critical illness itself. Furthermore, the use of music as a therapeutic intervention is simple and inexpensive, takes little time to implement, and results in no negative side effects.

CHAPTER VI

CONCLUSION AND RECOMMENDATION

This study was an experimental research aimed to test the effectiveness of music therapy in increasing relaxation by reducing anxiety level, decreasing physiological responses, and increasing vital capacity and oxygen saturation in between using music therapy and using no music therapy among mechanically ventilated patients. The study was conducted in three settings; the medical intensive care unit, the coronary care unit, and the intermediate care unit, Department of Internal Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand, from July 2000 to January 2001.

The instruments used in this study were experimental instruments and data collected instruments. The experimental instruments were the portable compact disk player with headphones, four sets of natural music collection, and portable bedside monitors. The data collected instrument were demographic data questionnaire, clinical characteristic data questionnaire, music therapy assessment tool, open-end satisfaction questionnaire, physiological and pulmonary function recording form, anxiety scale, APACHE II, and wright respirometor.

Data were collected by interviewing, observing, and measuring by the investigator. All data were analyzed by using the paired t-test from the SPSS version 9 for Windows.

Thirty mechanically ventilated patients were purposively selected for the study according to the predetermine criteria. There were 11 males and 19 females,

whose ages range from 18 to 70 years with the average of 46.73 years (SD=14.76 years). The change over design was used in which each subjects served as their own control. All thirty subjects received both music therapy and no music therapy intervention.

In the experimental period, all subjects received chance for selecting natural music from the investigator's collection. The investigators assessed the subjects' music preference before starting intervention and then the subjects started to listen to the chosen music through headphones via portable compact disk player for 30 minutes during receiving mechanical ventilation. In the control period, all subjects received no music therapy via silent headphones.

Data were analyzed by using the paired t-test. The results of this study showed that:

1. Comparison of the mean change in decreasing of anxiety score among music therapy period (M=2.63, SD=0.99) and without music therapy period (M=0.53, SD=0.51) showed statistically significant differences ($p< 0.05$).

2. Comparison of the mean change in increasing of VC score among music therapy period (M=180.67, SD=65.54) and without music therapy period (M=17.67,SD=39.36) showed statistically significant differences ($p< 0.05$).

3. Comparison of the mean change in decreasing of mean heart rate among music therapy period (M=5.30, SD=3.21) and without music therapy period (M=2.33, SD=2.54) showed statistically significant differences within the first 15 minutes and continued for the remainder of the treatment condition ($p< 0.05$).

4. Comparison of the mean change in decreasing of mean respiratory rate among music therapy period (M=3.13, SD=2.05) and without music therapy period

(M=1.47, SD=2.30) showed statistically significant differences within the first 15 minutes and continued for the remainder of the treatment condition ($p< 0.05$).

5. Comparison of the mean change in decreasing of mean systolic blood pressure among music therapy period (M=3.97, SD=2.98) and without music therapy period (M=1.50, SD=4.14) showed statistically significant differences within the first 10 minutes and continued for the remainder of the treatment condition ($p< 0.05$).

Comparison of the mean change in decreasing of mean arterial pressure among music therapy period (M=5.92, SD=3.92) and without music therapy period (M=1.80, SD=3.67) showed statistically significant differences within 30 minutes ($p< 0.05$).

Comparison of the mean change in decreasing of mean diastolic blood pressure among music therapy period and without music therapy period showed no statistically significant differences.

6. Comparison of the mean change in increasing of mean oxygen saturation among music therapy period (M=0.53, SD=0.68) and without music therapy period (M=-0.17, SD=0.83) showed statistically significant differences within the first 5 minutes and continued for the remainder of the treatment condition ($p< 0.05$).

7. Comparison of the mean differences of mean anxiety score, heart rate, respiratory rate, and systolic, diastolic blood pressure and mean arterial pressure among pretest and posttest scores in music therapy period showed statistically significant differences ($p<0.05$).

Comparison of the mean differences of mean VC score, oxygen saturation among pretest and posttest scores in music therapy period showed statistically significant differences ($p<0.05$).

8. Comparison of the mean differences of mean anxiety score, heart rate, respiratory rate, and systolic, diastolic blood pressure and mean arterial pressure among pretest and posttest scores in without music therapy period showed statistically significant differences ($p<0.05$).

Comparison of the mean differences of mean VC score among pretest and posttest scores in without music therapy period showed statistically significant difference ($p<0.05$), but no statistically significant differences in oxygen saturation.

From these results, music therapy was found to be much effective in improving the stress experiences associated with mechanical ventilation, and also initiating the relaxation response with result in anxiety reduction, VC and oxygen saturation improvement.

Recommendation for Practice Application:

From this study, the music therapy intervention for anxiety reduction and promote relaxation in mechanically ventilated patients should be developed as a standard of care for evidence based practice. Thus, the benefits of music therapy can be addressed at in service education programs for both professional and personal use.

Providing quiet environment and uninterrupted period should be organized as a standard of care for balancing against the patient's need for rest in critical care unit.

Recommendation for Further Research:

The effectiveness of music therapy intervention should be tested in other populations in critical care setting such as long-term ventilated patients and difficult to weaning, and unconscious or agitated patients. Another suggestion for testing is the

effective of music in the patients with different cultures and different preference of types of music.

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APPENDIX

Appendix A

Consent to Participate in Research Study

Human Rights for Research Population

To.....

I am "Sumolchat Puang-Ngern" a graduate nursing student, Nursing Department, Faculty of Medicine, Ramathibodi Hospital, Mahidol University. I am interested in research study. I would like to test the effectiveness of music therapy intervention in increase relaxation by; reduction of anxiety, improve physiologic response and the pulmonary function in patients receiving mechanical ventilation. However, the research will not be completed if there is no participation from you.

You can participate in this research study by listening natural music for 30 minutes in the experimental period and receiving the rest time for 30 minutes in the control period. The anxiety, pulmonary function, and physiologic response will be measured by the investigator before, during, and after each intervention. Furthermore, I would like to ask some personal information and clinical data. All this information will be confidential and will be used only to present an overall picture. Your name will not appear in the report or in any other place. It is your choice whether to participate or not in the study, and your decision will not affect the quality of care you receive in this intervention. Even during the study period, you can withdraw from the study at anytime.

Thank you for your kind cooperation

Sincerely yours

Sumolchat Puang-Ngern

Appendix B

QUESTIONNAIRE

Part I: General Characteristics.

Patient No. …… Ward ……

Date ……

1. Sex

   ( ) Male ( ) Female

2. Age …… years

3. Marital Status

   ( ) Single ( ) Married ( ) Widowed

4. Religion

   ( ) Buddhism ( ) Others; please identify ……

5. Hometown

   ( ) Bangkok ( ) Others province; please identify ……..

6. Education Background

   ( ) Prathom ( ) Mattayom ( ) Certificate

   ( ) Diploma ( ) Bachelor ( ) Master

   ( ) Others; please identify ……

7. Occupation

   ( ) Business ( ) Government official

   ( ) Agriculturist ( ) Employee

   ( ) Unemployed ( ) Other, please identify ……

8. Family income …… bath

9. Hospital payment by

( ) Self ( ) Government insurance

( ) Social service ( ) Social insurance

Part II: Data of the disease, respiratory treatment and relaxation techniques.

1. Cause of respiratory failure .....
2. Underlying disease .....
3. Length of admission ..... days
4. Length of ventilation .....days
5. Type of Endotracheal Tube

( ) Nasal ( ) Oral ( ) Tracheostomy

6. Type of ventilator

( ) Benett 7200 ( ) MAI ( ) Others .....

7. Mode of ventilation

( ) CMV ( ) SIMV ( ) PCV ( ) CPAP

8. Respiratory pattern while receiving mechanical ventilation .....
9. Use of Sedative drugs or music relaxant

( ) Yes ( ) No

10. Use of Antibiotic drugs

( ) Yes ( ) No

Type ..... Method ..... Dosage .....

11. Complication while receiving mechanical ventilation .....
12. Previous of current use of relaxation techniques .....

Part III: Music Therapy Assessment

1. Do you like to listen to music?

   ( ) Yes ( ) No

2. When do you like to listen to music? (ie, for relaxation, stress reduction, pure enjoyment, to pass time, with exercise, for player, etc.) .....

3. What type of music do you enjoy? .....

4. Any specific artist or instrument type you particularly enjoy?

   ( ) Yes ( ) No

5. Are there any types of music or that you **do not** like?

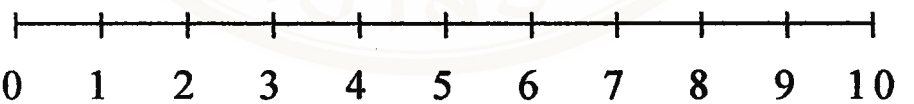
   ( ) Yes ( ) No

   If yes .....

6. What type of natural sounds do you like?

   ( ) Wind ( ) Stream ( ) Sea ( ) Songbirds

7. On a scale 1 to 10, how would you rate the importance of music in your life.



Part IV: The open–ended satisfaction for using Music Therapy Questionnaire

Direction Please assesses your satisfaction level, describe advantage for using music therapy while receiving mechanical ventilation.

1. What are you satisfaction level for this music therapy?

   ( ) High ( ) Moderate ( ) Low ( ) Not satisfaction

2. The advantage for music therapy while receiving mechanical ventilation

   ……

   ……

   ……

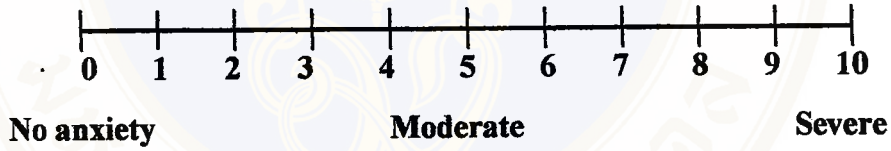
Part V.

PHYSIOLOGIC RECORD FORM

Variable	Time								
	Baseline	Begin	5 min	10 min	15 min	20 min	25 min	30 min	5 min post
Heart rate									
Respiratory rate									
Blood pressure									
O_2 Saturation									

Before Music therapy

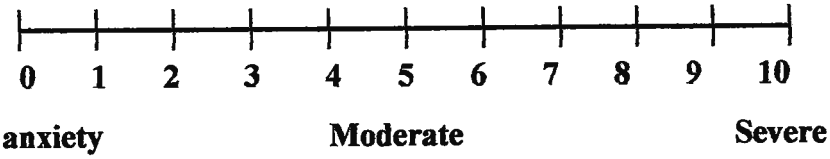
1. How anxious are you now?



VC : Before ..... L.

After Music therapy

1. How anxious are you now?



VC: After ..... L.

Appendix C

APACHE II IN CRITICAL CARE UNIT

Acute physiologic score

Physiologic variable	**Day 1**	**Day 2**	**Day 3**	**Day 7**	**DISCHARG**
Respiratory rate					
Temperature					
Mean arterial pressure					
Heart rate					
Oxygen saturation a) Fio_2.>0.5, A-a DO_2 b) Fio_2 <0.5, PaO_2					
Arterial PH					
Serum sodium					
Serum potassium					
Serum creatinine					
Hematocrit					
White blood count					
Glasgow coma score					
Total APS					

APACHE II score

APS points……

Age points……

Chronic health points……

Total APACHE II……

BIOGRAPHY

NAME	Miss Sumolchat Puang-Ngern
DATE OF BIRTH	16 January 1964
PLACE OF BIRTH	Bangkok Thailand
INSTITUTIONS ATTENDED	Mahidol University, 1983-1986: Bachelor of Science (Nursing)
	Mahidol University, 1997-2001 Master of Nursing (Adult Nursing)
POSITION & OFFICE	1985-Present, Ramathibodi Hospital, Faculty of Medicine, Mahidol University
	Position: Nurse 6