The Effects of Music on Anxiety Reduction in Patients with Ventilator Support

Suhartini Ismail

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Nursing Science (International Program)

Prince of Songkla University

2010

Thesis Title	The Effects of Music on Anxiety Reduction in Patients with Ventilator Support
Author	Mrs. Suhartini Ismail
Major Program	Nursing Science (International Program)

Major Advisor:

…………………………………………
(Dr. Charuwan Kritpacha)

Co-advisor:

…………………………………………..
(Asst. Prof. Dr. Ploenpit Thaniwatatanon)

Examining Committee:

……………………………… Chairperson
(Asst. Prof. Dr. Wongchan Petpichetchian)

……………………………………………
(Asst. Prof. Dr. Sasikaan Nimmaanrat)

……………………………………………
(Dr. Supaporn Wannasuntad)

……………………………………………
(Dr. Charuwan Kritpacha)

……………………………………………
(Asst. Prof. Dr. Ploenpit Thaniwatatanon)

The Graduate School, Prince of Songkla University, has approved this thesis as partial fulfillment of the requirements for the Master of Nursing Science (International Program).

…………………………………………..
(Assoc. Prof. Dr. Krerkchai Thongnoo)
Dean of Graduate School

Thesis Title The Effects of Music on Anxiety Reduction in Patients with Ventilator Support

Author Mrs. Suhartini Ismail

Major Program Nursing Science (International Program)

Academic Year 2009

ABSTRACT

Music is a non-pharmacological nursing intervention that can be used complementarily in the care of patients receiving ventilator support. The study aim was to compare the effects of music intervention on anxiety reduction for patients receiving ventilator support in intensive care units in Indonesia.

It was a quasi experimental study using a non-equivalent control group and pre-test/post-test design. Forty subjects were assigned into either a control or experimental group (20 subjects/group) by matching technique and using lottery technique. The outcome measures were state anxiety measured at pretest and posttest and physiologic measures, including systolic and diastolic blood pressure, heart rate, and respiratory rate obtained every 10 minutes for 20 minutes of music intervention. Data analysis used Chi-square test, Fisher-exact test, independent *t*-test, and paired sample *t*-test.

The findings showed that the subjects who received music intervention had significantly lower anxiety levels than those in the control group ($p < .05$). The subjects in the experimental group demonstrated statistically significant reductions in physiological responses ($p < .05$). The findings also showed that there was a significant difference in systolic blood pressure, but there was no significant difference in diastolic blood pressure, and heart rates, between the two groups. There was a significant difference in respiratory rates between experimental and control groups. Although, the physiological response variables showed that there were statically significant differences, interestingly, it was only diastolic blood pressure that showed the reduction of mean score from pretest to posttest in the experimental group and in the control group.

Keywords: music intervention, anxiety, ventilator support, physiological responses

ACKNOWLEDGMENT

I am most thankful to the Indonesian government, who has provided me with a full scholarship through the Directorate of Higher Education, the Ministry of Education, to study at Prince of Songkla University. I am also deeply grateful to the Graduate School of Prince of Songkla University for giving me some part of the funding to finish this thesis.

I would like to express my deepest appreciation to my mayor advisor, Dr. Charuwan Kritpacha, who has the attitude and substance of a genius. She has continually and convincingly conveyed a spirit of adventure in regard to research and an excitement to teaching. Without her guidance and continual assistance this thesis would never have been possible. I am also heartily thankful to my co-advisor, Dr. Ploenpit Thaniwattatanon, whose encouragement, guidance and support from the initial to the final level has enabled me to develop an understanding of the subject. I also would like to convey my sincere appreciation to Dr. Wongchan Petpichetchian and Dr. Wipa Sae-Sia, who have given me guidance in the data analysis processing. Without their assistance and persistent help this thesis would not have been finished.

I acknowledge Kariadi Hospital and Tugurejo Hospital for the consent granted to me to collect the data on their patients as crucial part of my thesis. I also express my deepest appreciation to all participants who took part in this study.

My deepest thanks are also addressed to Linda Chlan for the permission given to me to include her work of instrument development. I extend the acknowledgement to Prof. Dr. Johannes Ananto Prayogo who has helped me edit this thesis and beef up its language accuracy.

I am greatly grateful to my husband, M. Fatkhul Mubin, S,Kp, M.Kep., Sp. Jiwa, and my two children (Fatkhiya Khoirunnisa and Sholahudin Al Ayubi) who always pray for me and give me strong motivation to make my dreams come true. My deepest thanks also addressed to my father and my mother (Drs. H. Ismail, A.T., and Hj. Fatimah) who always give me their support in praying to Allah SWT. Finally I offer my best regards and blessings to all who have supported me in any respect during the completion of the study.

Suhartini Ismail

CONTENTS

Page

Cover page i

Approval page of master degree ………………………………………….. ii

Abstract ………………………………………………………………….. iii

Acknowledgement ………………………………………………………. iv

Contents…………………………………………………………………... v

List of figures ……………………………………………………………. xi

List of tables ……………………………………………………….......... x

CHAPTER

1. INTRODUCTION…………………………………………………….. 1

Background and significance of the problem …………………………... 1

Objectives of the study ………………………………………………….. 4

Research questions …...…………………………………………………. 5

Conceptual framework of the study …………………………………….. 5

Hypotheses of the study …………………………………………………. 8

Definition of terms ………………………………………………………. 9

Significance of the study ………………………………………………… 10

2. LITERATURE REVIEW ……………………………………………… 11

Anxiety in Patients on Ventilator Support ……………………………….. 12

Theories and definition of anxiety ……………………………………. 12

Pathophysiology of anxiety …………………………………………… 15

Causes of anxiety in patients on ventilator support ………………… 16

CONTENTS (continued)

Level of anxiety in patients on ventilator support ………………….. 19

Influencing factors of anxiety in patients on ventilator support ……. 21

Medication used in patients on ventilator support ………………….. 26

Assessment of anxiety outcomes ……………………………………... 28

Music and Music intervention ……………………………………………. 31

Philosophical and theoretical effects of music ………………………. 31

The benefits of music …………………………………………………. 33

Music intervention process …………………………………………… 35

Effects of music on anxiety reduction in patients with ventilator support ……………………………………………………………………… 37

Music preferences……………………………………………………. 41

Javanese music ………………………………………………………. 43

3. RESEARCH METHODOLOGY ………………………………………….. 47

Research design ……………………………………………………………. 47

Variables …………………………………………………………………… 48

Setting ……………………………………………………………………… 48

Population and sample …………………………………………………….. 49

Inclusion criteria …………………………………………………………… 50

Exclusion criteria ………………………………………………………….. 50

Sample size ………………………………………………………………… 50

Sampling procedures ………………………………………………………. 51

Instruments …………………………………………………………………. 52

CONTENTS (continued)

The demographic data questionnaire (DDQ) ………………………… 52

The state inventory (SAI) and trait anxiety inventory (TAI) ………… 53

Instruments for physiological measurement ………………………….. 54

Experimental instruments …………………………………………….. 55

Validity and reliability of instruments …………………………………….. 55

Translation of instruments …………………………………………………. 56

Pilot study ………………………………………………………………….. 57

Data collection procedures ………………………………………………… 58

Ethical consideration ……………………………………………………. 62

Data analysis ……………………………………………………………. 62

4. RESULTS AND DISCUSSION……………………………………………. 64

Results…………………………………………………………………… 64

Demographic characteristics………………………………………….. 64

Clinical characteristics ……………………………………………….. 66

The level of state anxiety …………………………………………….. 68

Baseline parameters ………………………………………………….. 69

Effects of music intervention on state anxiety ………………………. 70

Effects of music intervention on physiological responses……………. 71

Discussion……………………………………………………………………... 76

Characteristics of the subjects ……………………………………… 76

Hypothesis testing …………………………………………………….. 79

CONTENTS (continued)

5. CONCLUSION AND RECOMMENDATIONS ………………………….. 87

Conclusion ……………………………………………………………… 87

Strengths and limitations …………………………………………….... 88

Implications and recommendations ………………………………….... 90

References ……………………………………………………………………… 91

Appendix

A Research information sheet to participate in the study …………………. 105

B Demographic data questionnaire (DDQ) ……………………………….. 108

C State anxiety inventory ………………………………………………….. 109

D Trait anxiety inventory …………………………………………………. 110

E Observation form for physiological responses at each time point ……… 111

F Instruction to patient on music listening ……………………................... 112

G Gamelan music test ……………………………………………………... 113

VITAE …………………………………………………………………………... 115

LIST OF FIGURES

Figure	Title	Page
1	Theoretical framework …………………………………….	8
2	Study procedures ………………………………………..	61

LIST OF TABLES

Table	Title	Page
1	Music therapy assessment and implementation tool (MAIT) …...	37
2	The distinctive qualities of music ……………………………….	39
3	Demographic characteristics of the experimental and of the control groups (N = 40) …………………………………………	65
4	Clinical characteristics of the experimental group and control group (N = 40)…………………………………………………...	67
5	The state anxiety levels of the experimental group and of the control group before music intervention (N = 40) ………………	68
6	Baseline differences of trait anxiety, state anxiety, and physiological responses in the two groups (N = 40)…………….	69
7	Pre-test and Posttest State Anxiety Scores between the Experimental Group and the Control Group (N = 40)…………..	70
8	Pre-test and post-test of state anxiety scores of the experimental and of the control group (N = 40) ……………………………….	71
9	The actual mean difference between the experimental group and the control group of physiological responses at each time point (N = 40) ……………………………………………………….	71
10	The comparison of mean difference between the experimental group and the control group on physiological responses for T1 to T_2 (N = 40)……………………………………………………….	73

LIST OF TABLES (continued)

Table	Title	Page
11	The comparison of mean difference scores between the experimental group and the control group on physiological responses for T_1 to T_3 (N = 40) …………………………………	74
12	The comparison of mean difference scores on physiological responses from T_1 to T_2 and T_1 and T_3 in the experimental group (N = 20) …………………………………..............................	75
13	The comparison of mean difference scores of physiological responses from T_1 to T_2 and T_1 to T_3 in the control group (N=20)	75

CHAPTER 1

INTRODUCTION

This chapter presents background of the study and significance of the problem, the objectives of the study and research questions. It also describes conceptual framework of the study, hypotheses, definition of terms, and significance of the study.

Background and Significance of the Problem

Ventilator support is a life-saving treatment for patients with respiratory failure. Although ventilator support saves lives, it can also cause many negative physiological and psychological impacts on patients. Such physiological impacts include breathlessness, sleeplessness, immobility, restlessness, inability to talk, and the need for frequent suctioning. Anxiety is the most common psychological impact that ventilator support has on patients (Chlan, 2003; Seaward, 2002). Anxiety increases sympathetic nervous system stimulation, breathing difficulty, oxygen demand, and myocardial stimulation, all of which contribute to high levels of anxiety (Chlan, 1998). Patients using mechanically-ventilated support systems often experience adverse events due to this anxiety, such as constriction of arteries and airways in the lungs (Yagan, White, & Staab, 2002).

Anxiety is an emotional state involving subjective feelings of tension, apprehension, nervousness, and worry. The physical manifestations of anxiety in patients with ventilator support involve extreme shifts in body temperature, urinary urgency, dry mouth, dilated pupils, loss of appetite, and diaphoresis. Ventilator support can also cause negative psychological responses, including fear of the unknown and of dying, sleeplessness, pain, immobility, loneliness, and powerlessness (Chlan, 1995). Many patients have difficulty in matching their own breathing patterns with ventilators, and they are apprehensive during endotracheal suctioning (Rotondi et al., 2002). In order to reduce anxiety, clinicians usually prescribe certain medications, but these are not necessarily innocuous. Use of such pharmacological agents may result in the development of a paradoxical worsening of a patient's confusion and agitation, as well as muscular weakness, which can delay ventilator weaning (Chlan, 1998).

Research studies regarding non-pharmacological interventional methods for reducing anxiety in patients with ventilator support were already done (Thomas 2003; Chlan, 1998, and Wong, Lopez-Nahas, & Molassiotis, 2001). Thomas (2003) identified four common stressors in patients using mechanical ventilators: dyspnea, anxiety, fear, and pain. The researcher identified four intervention methods which might be helpful in reducing anxiety in such patients. These included hypnosis and relaxation, patient education and information sharing, music therapy, and supportive touch. While any of these non-pharmacological interventions to manage anxiety among patients with ventilator support could be used, music seemed to be the most straightforward. Chlan (1998) and Wong, Lopez-Nahas, & Molassiotis (2001) also found that music therapy was an effective nursing intervention method to reduce anxiety in patients with ventilator support.

Several research studies testing the effects of music were conducted in Western countries (Alejandra, 2007; Angela, Chung, Chan, & Chan, 2005; Chlan, 2000; Guétin et al., 2009), Thailand (Cholburi, Hanucharurnkul, & Waikakul, 2004; Phumdoung, Youngvanichsate, Jongpaiboonpatana, & Leetanaporn, 2007), China (Wong et al., 2001; Wu & Chou, 2008), and Japan (Suda, Morimoto, Obata, Koizumi, & Maki, 2008). The results from these studies suggested that music reduces anxiety and pain. The effects of music were already examined in special populations, such as adult postoperative patients (Agwu & Okoye, 2007; Aragon, Farris, & Jacgueline, 2002; Chan, 2007), palliative care patients (Horne-Thompson & Grocke, 2008), and ventilator support patients (Almerud & Petersson, 2003; Angela et al., 2005; Chlan, 1998; Dileo, Bradt, & Grocke, 2008; Wong et al., 2001). These studies concluded that music aids relaxation and pain relief. However, research on the effects of music intervention on the anxiety of ventilated patients is limited to the work of a small number of researchers.

Suhartini (2008) conducted a pilot study regarding to the effects of music on reducing anxiety in patients in intensive care unit of Karyadi Hospital, Semarang Central Java, Indonesia. It revealed that music can produce a beneficial physiological response in patients with anxiety in the intensive care unit. Ninety percent of these patients experienced reduced systolic blood pressure. Also, 95% of these patients had reduced diastolic blood pressure. Furthermore, 60% of these subjects had a reduced respiration rate, and all of them had a reduced pulse rate. This study was a descriptive correlation study using twenty patients, without a control group and without the control of the extraneous variables.

Previous studies have cited the benefits of using music intervention to reduce anxiety in patients with ventilator support. In some of the studies, the patients listened to western music, classical music, new age music (Chlan, 1998), or Chinese music (Wong et al., 2001). Uses of western music, classical music, and new age music might be preferable, as patients will be familiar with these genres and thus these genres will be more likely to reduce anxiety (Dileo et al., 2008). Dileo et al explained that western music, classical music, and new age music were used in previous studies because these genres had already been shown to have beneficial effects on the body. One example is classical music, which is widely used with pregnant women to stimulate the intelligence of their unborn babies (Stewart & Walsh, 2005). In this study, however, the researcher used *gamelan* music. *Gamelan* music originates from Java Island, Indonesia. Since the researcher used *gamelan* music to determine its anxiety-reducing effects in patients with ventilator support, this music, according to Bodman and DeArment (2009), was characterized by its slow harmony, consistent tone color, and low pitch. Thus, *gamelan* music was used in this study, as no previous Indonesian study had examined the effects of *gamelan* music on reducing anxiety in patients with ventilator support.

Objectives of the Study

The objectives of this study were formulated as follows:

1. To compare the anxiety level of the experimental group before and after receiving music intervention.
2. To compare the anxiety levels of the experimental group and the control group after music intervention.
3. To compare the physiological responses of the experimental group before and after receiving music intervention.

4. To compare the physiological responses of the experimental group and the control group after music intervention.

Research Questions

The research questions were stated as follows:

1. Is the anxiety level of the experimental group after receiving music intervention lower than that before receiving music intervention?
2. Is the anxiety level of the experimental group after receiving music intervention lower than that of the control group?
3. Do the physiological responses of the experimental group after receiving music intervention show significantly greater reduction than those before receiving music intervention?
4. Do the physiological responses of the experimental group show greater significant reduction than those of the control group after receiving music intervention?

Conceptual Framework of the Study

The conceptual framework of the study was derived from the conceptualization of the entrainment theory. The entrainment theory was first proposed by Christian Huygens in 1665 as he observed the motion of two pendulum clocks (as cited in Seaward, 2002). He found that the two pendulums swing together in a unified rhythm. Entrainment is a process whereby two objects oscillating at similar frequencies interact and become synchronous with one another, thereby resonating at the same frequency. This matched rhythm is called entrainment, and is defined as the mutual phase-locking oscillation of like frequencies in the same environment. For example, if one organ (i.e. a heart) increases its oscillations, as a result of heightened metabolic activity, adjacent organs are influenced to entrain to that frequency (i.e. lungs and kidneys). If several body organs are caused to entrain at higher frequencies over time, the result is a lowering of the body's ability to return to a homeostatic condition (Seaward, 2002).

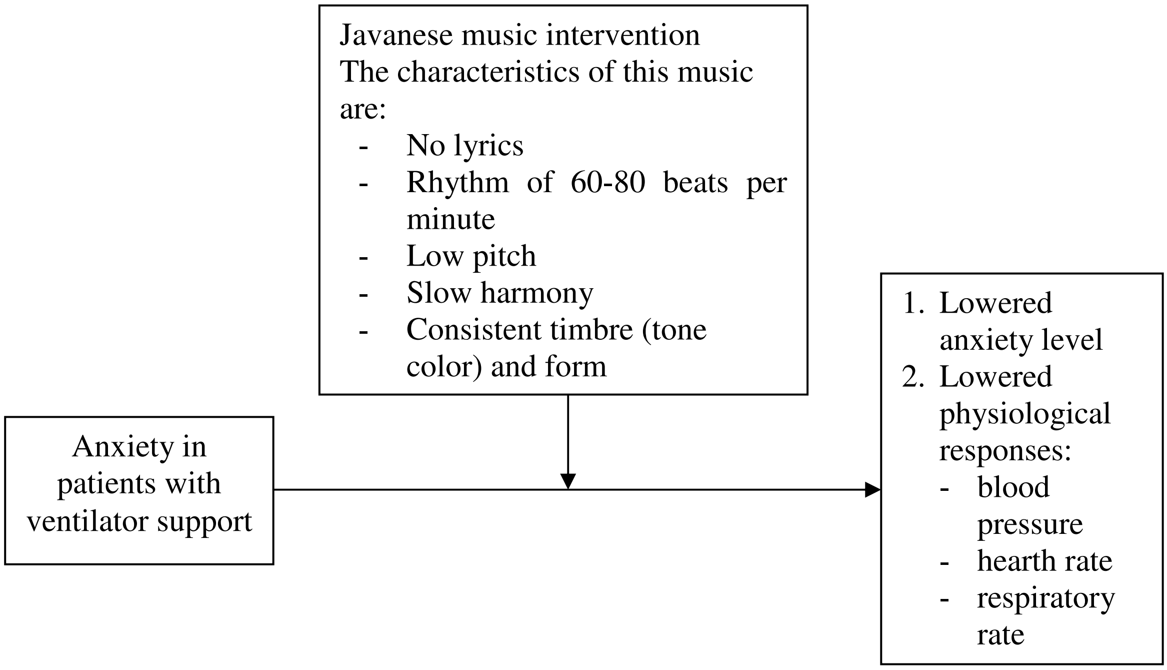
Music exerts its effect on the body by causing it to entrain to the rhythms of the musical selection. Musical selections with slow, flowing rhythms that duplicate pulses of 60-80 beats per minute are ideal for bringing about relaxation (Chlan, 1998, 2009). Music promotes relaxation via physiological and/or psychological entrainment. Both musical stimuli and physiological responses to the stimuli are composed of vibrations that occur in a regular, periodic manner and consist of oscillations. Musical stimuli, specifically rhythm and tempo, can be used as synchronizers to influence changes in physiological response by means of entrainment (Seaward, 2002). When one is using music to induce relaxation through entrainment, the music should have the following properties: a tempo at or below a resting heart rate (< 80 beats per minute), predictable dynamics, fluid melodic movement, pleasing harmonies, regular rhythm without sudden changes, tonal qualities, and specially synthesized tones (American Music Therapy Association, 2007). The tempo or beat of such music can cause physiological responses to entrain with the music. In addition, such music has the potential to entrain the heart rate through the pulse or to entrain breathing through the rhythm (Chlan, 2000).

Although the ideal dosage of music therapy for inducing relaxation is unknown, practice guidelines suggest twice a day for 30 minutes; a minimum of 20 minutes is thought necessary to induce relaxation (Chlan, 2000). Musical properties are used to induce relaxation because they cause body rhythms to slow down and entrain to the slower beat of the music.

The entrainment of body rhythms (i.e. heartbeat and breathing) with that of relaxing music is thought to decrease sympathetic nervous system activity and induce a dampening in the arousability of the central nervous system. These responses in turn lead to decreased adrenergic arousal, manifesting physiologically as decreases in heart rate, respiratory rate, oxygen consumption, skeletal muscle tension, epinephrine level, and blood pressure in people with hypertension (Everly & Benson as cited in Chlan, 2000). Anxiety in patients with ventilator support is linked to increase autonomic arousal and is a frequent reason for sedation. Music with steady, slow, and repetitive rhythms is thought to exert a hypnotic effect, contributing to relaxation and anxiety-reduction through cognitive quieting and the induction of altered states of consciousness (Guzetta as cited in Chlan, 2000). In addition, music can alter levels of anxiety while facilitating more relaxed physiological responses (Thaut & Davis as cited in Chlan, 2009)

In this study, *gamelan* music was used in patients with ventilator support as this music had a slow harmony and consistent tone color and form (Bodman & DeArment, 2009). *Gamelan* music has two predominant scales: *Slendro* and *Pelog*. Each has a unique character identified by the intervallic relationships between tones. Though both of these scales vary considerably in actual measurement from one piece of *gamelan* music to another, their basic form is consistent throughout the genre. In common practice, *Slendro* is characterized by a five (2 3 2 2 3) tone scale, which is the basic order of intervals from low to high. *Pelog* is characterized by a seven (1 2 3 1 1 2 2) tone scale, which consists of a half step of note to minor third interval (Bodman & DeArment, 2009). In summary, *gamelan* music has a slow rhythm, consistent tone color and form, and a low pitch.

Figure1 Theoretical Framework



Hypotheses of the Study

The hypotheses of the study were working hypotheses that were stated as follows:

1. The level of anxiety of the experimental group after receiving music intervention is lower than that before the music intervention.
2. The level of anxiety of the experimental group after receiving music intervention is lower than that of the control group.
3. The physiological responses of the experimental group show significant reduction after music intervention

4. The physiological responses of the experimental group after receiving music intervention show significantly greater reduction than those of the control group.

Definition of Terms

Anxiety refers to a state of uneasiness, tenseness, apprehension and uncertainty among patients, and is usually present among patients with ventilator support. There were two kinds of anxiety, which were measured in this study: state anxiety and trait anxiety. State anxiety refers to a general state of uneasiness, tenseness, apprehension and uncertainty in particular moment. In this study state anxiety was assessed by the shortened version State Anxiety Inventory (SAI) that had been developed by Chlan, 2003. Trait anxiety, on the other hand, is variable among individuals, and is a person's general susceptibility to anxiety. In this study trait anxiety was measured with the full version of the Trait Anxiety Inventory (TAI) (Spielberger et al., 1983).

Physiological responses are the body's vital signs, and were measured as either normal or abnormal. The physiologic responses included hearth rate, respiratory rate, and systolic and diastolic blood pressure. The measurement of these responses was implemented through non-invasive bedside monitor. Data were collected at 3 time points: before intervention (T_1), at 10 minute music intervention (T_2), and at the end of the 20-minute intervention (T_3).

Music intervention refers to the use of recorded music played via headphone to reduce anxiety in patients with ventilator support. Each music intervention was played approximately 20 minutes, and was provided two times a day, in the morning and evening time (10 a.m. and 4 p.m.). The characteristics of the music were as follows: no lyrics, rhythm between 60-80 beats per minute, low pitch, slow harmony, and consistent tone color. Only *gamelan* music was employed.

Significance of the Study

Music therapy is a non-pharmacological nursing intervention that could be used as a complementary adjunct in the care of patients receiving ventilator support. Two reasons why music is an attractive medium for a therapeutic nursing intervention are that it is not harmful and it is easy to use. Music intervention for patients is an inexpensive intervention method, as it does not require the use of extra manpower and resources, training, or specialized equipment. The findings of this study provided evidence regarding the use of music as a nursing intervention, and they added new knowledge to the topic of anxiety reduction through the entrainment of human physiological processes. The results of this study also provided a basis for other researchers to conduct further studies, or encourage other researchers to conduct similar studies in their own settings.

CHAPTER 2

REVIEW LITERATURE

This part elucidates some theories that have associations with anxiety in patients with ventilator support, and the effects of music intervention on this anxiety. The review covers the following topics:

Anxiety in patients with ventilator support that includes:

Theory and definition of anxiety

Pathology of anxiety

Causes of anxiety in patients with ventilator support

Anxiety in patients with ventilator support

Types of anxiety in patients with ventilator support

Influencing factors of anxiety in patients with ventilator support

Assessment of anxiety outcomes

Music and music intervention in patients with ventilator support, that includes:

Concepts of music and music intervention

Philosophical and theoretical bases related to music intervention

Music intervention process

Effects of music on anxiety reduction in patients with ventilator support

Music preferences

Javanese music

Anxiety in Patients with Ventilator Support

Theories and Definition of Anxiety

There are three main theories that explain the causes of anxiety. These theories are psychoanalysis theory, behavioral theory, and biological theory (Sadock & Sadock, 2003). The theories explain that anxiety comes from exposure to external unsympathetic energy. People then seek to take advantage of the anxiety response in penetrating the conflict rather than accepting it. As a result, anxiety affects normal physical and mental conditions and this leads to behavioral and emotional abnormalities.

1. Psychoanalytical Theory

Sigmund Freud explained that anxiety is a sign of the perception of risk from the unconscious status (Sadock & Sadock, 2003). This, according to the theory, owes to the psychological conflict of unconscious sexual or aggressive desires and the threat of superego or external reality. The signs of anxiety emerge from the ego using psychological protective mechanisms to prevent undesired thinking or feeling, which is expressed as consciousness. Anxiety may derive from an individual perception. A person believes that he or she is in danger of an external harsh force and seeks to exploit the anxiety response by penetrating the conflict rather than ignoring it.

2. Behavioral Theory

Behavioral theory states that the response of a person to anxiety depends on a particular stimulus. This theory proposes that anxiety comes from an assessment of the environment, where conditions are deemed to be unsafe and violent beyond what one can tolerate. It affects the normal physical and mental condition and this leads to behavioral and emotional abnormalities. Existentially, this theory explains that anxiety occurs because the person regards life as meaningless and suffers from having to live with this perception of reality. Hence, the person suffers from anxiety.

3. Biological Theory

Biological theory was developed from clinical studies on experimental animals suffering from induced anxiety. This theory states that biological changes cause anxiety, or that anxiety causes biological changes. It emphasizes individual responses and sensitivity to biological responses.

The term "anxiety" comes from the Greek word *agon*, and is derived from the modern words *anguish* and *agony.* In German, agon is used for describing painful feelings of terror and dread (Grimm, 1997; Hooi, 2007). In Latin, *Agon* has a similar meaning: narrow or shrunken and causing discomfort. The definition also includes a feeling of restlessness and worry towards uncertain situations. Sometimes it refers to fear of consequences. People feel impatient, oppressed, fearful, and/or frightened about the unknown, and possibly uncertain or unsure about the future (Glas, 2003).

Anxiety is defined as a subjective experience of apprehension or tension, imposed by the expectation of danger or distress, necessitating the need for special action (Kelly, 1980). Sir Aubrey Lewis as cited in Kelly (1980) in his classic paper, examined the problems presented by the word anxiety, as used in psychiatry. He discussed the usage of the word and its derivations and listed the characteristics of anxiety in the following categories:

1. It is an emotional state involving subjectively experienced qualities of fear or similar emotions (terror, alarm, fright, panic, dread).

2. The emotion is unpleasant. It may be a feeling of impending death or collapse. It is directed towards the future.
3. There are subjective bodily discomforts during the period of the anxiety: a sense of constriction in the chest, tightness in the throat, difficulty in breathing, and weakness in the legs.

There are several bodily disturbances which manifest during anxiety. Some of these are of functions normally under voluntary control, such as agitation, propensity to scream, and sudden defecation. Others are not under voluntary control, including dryness of the mouth, excessive sweating, tremors, the need to vomit, palpitations, and other physiological and biochemical functions that can be detected with appropriate methods of investigation.

The American Psychiatric Association (2000) defines anxiety as a response to life events, feelings of uncertainty, uneasiness, apprehension, or tension that a person experiences in response to an unknown object, situation, or danger, the source of which is largely unrecognized. Furthermore, Spielberger and colleagues (1983) separate anxiety into state anxiety and trait anxiety.

State anxiety is defined as an unpleasant emotion characterized by subjective feelings of tension, worry, and heightened autonomic activation of the nervous system. State anxiety is often transitory, and it can fluctuate and recur when appropriate stimuli evoke it (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

People with both state and trait anxiety exhibit a general tendency to perceive and respond to threats in the environment. When a person is faced with stressful situations, trait anxiety causes him or her to perceive them as dangerous and threatening, and the person responds to them with an intense elevation of state anxiety. It endures over time and tends to be relatively stable and predictable. The stronger the trait anxiety, the more probable the individual will experience more intense and more frequent elevations of state anxiety in the threatening situation.

Several studies (Chlan, 1998; 2003; Chlan, Engeland, Anthony, & Guttornson, 2007; Dahlen & Janson, 2002; Mok & Wong, 2003) also defined anxiety as an emotional state involving subjective feelings of tension, apprehension, nervousness, and worry, and found these feelings to be associated with the sympathetic nervous arousal system. The physical manifestations of anxiety involve extreme shifts in body temperature, urinary urgency, mouth dryness, pupil dilation, appetite loss, and diaphoresis. Thus, anxiety is the emotion and feeling that occurs when an individual faces a stressful situation. The individual will assess the situation as unsafe, dangerous, and insecure. She or he will take steps to protect herself or himself from the perceived danger. This assessment depends on individual beliefs, thinking processes, perceptions, and past experiences. Once a person falls into this situation, she or he will respond physically (shaking, sweating, etc.), mentally (irritability, aggression, restlessness, etc.) and socially (fretfulness, stupefaction, etc.).

Pathophysiology of Anxiety

Anxiety reactions increase the secretion of adrenalin. There are three important facts that cause adrenalin to increase: 1) the adrenal medulla is linked to the sympathetic nervous system, 2) many physiological changes are known to complement emotional arousal (e.g., tachycardia, pupil dilatation, and signs of increased sympathetic nervous system activity), and 3) the adrenal glands share in widespread subjugation of the viscera to sympathetic control (Kelly, 1980).

Anxiety is correlated with adrenaline and noradrenaline excretion. A significant correlation between anxiety and adrenaline, and between aggressiveness and noradrenaline excretion, has been found in various types of psychiatric and medical patients (Cohen et al; Silverman et al., as cited in Kelly, 1980). In addition, anxiety can increase catecholamine production in response to the intensity of the psychological stimulus (Euler as cited in Kelly, 1980). The medulla of the adrenal gland produces nearly all of the adrenaline in the body, excluding only some of the noradrenaline and venous blood, leaving it catecholamine. The proportion between them is 80% adrenaline and 20% noradrenaline (Kelly, 1980). Adrenaline has both alpha and beta effects and causes an increase in heart rate and rise in systolic blood pressure, while diastolic blood pressure is unaltered or may even fall. Noradrenaline consists of almost pure alpha activity and causes a decrease in heart rate and rise in both systolic and diastolic blood pressure, due to constriction in the arterioles (Guyton, 1991; Kelly, 1980).

Moreover, anxiety can produce hyperventilation, involving shallow breathing, disorganized respiratory rhythms, and a sensation of breathlessness. Patients reporting shocking sensations and other breathing problems during anxiety are a common clinical experience. There has been sustained interest among researchers regarding a possible link between the malfunction of the respiratory system and anxiety (Griez & Perna, 2003).

Causes of Anxiety in Patients with Ventilator Support

Anxiety is a common phenomenon in patients with ventilator support. A common cause of anxiety in patients with ventilator support is the sense of a communication barrier (Alasad & Ahmad, 2004). Rotondi and colleagues (2002) studied 150 patients who received ventilator support for more than 48 hours. The researchers found that many of the patients did not remember the experience, but for those who did, they recalled that they were thirsty, felt tense and out of control, had difficulty swallowing and speaking, felt lonely, and experienced nightmares. Existing studies report that the causes of anxiety in patients with ventilator support consist of three stressors. They are as follows: (1) psychological stressors, (2) treatment stressors, and (3) environmental stressors.

Psychological Stressors. Recently, some studies described varied stressors that manifest in patients with ventilator support. These included sleep deprivation, nightmares, feelings of bewilderment, loneliness, and high levels of fear and anxiety that bring on attacks of terror and panic. In addition, patients also reported submission to caregivers, relatives' distress, depersonalization, and insecurity as factors leading to anxiety, and even agony (Lusk & Lash, 2005; Rotondi et al., 2002).

Obviously, patients with ventilator support are unable to communicate verbally. They often reported that they experienced psychological distress during treatment, including anxiety and fear. The sensation of breathlessness, frequent suctioning, inability to talk, uncertainty regarding surroundings, isolation from others, and general fear contributed to their high levels of anxiety (Bunt as cited in Chlan & Tracy, 1999; Dileo, Bradt, & Grocke, 2008; McKinley, Stein-Parbury, & Chehelnabi, 2004). Dependence on ventilator support to breathe and the inability to speak can bring on anxiety, which can result in sleep disturbances, increased myocardial oxygen consumption, and increased sympathetic output. Increased sympathetic output can lead to tachypnea, tachycardia, and hypertension, and it makes the process of weaning a patient off ventilator support equipment more difficult. The patients' inability to speak may also make it harder for nurses to meet their needs (Lindgren & Ames, 2005). They may have co-existing disorientation or suffer from drug effects, which make clear communication difficult. Furthermore, the physical manifestations of many disease states can mimic anxious behavior. In addition, lack of information, depersonalized care, and lack of sleep and rest were associated with fear, anxiety, and vulnerability.

Treatment Stressors. Patients with ventilator support are often unable to express their needs, or even synchronize their own breathing (Lusk & Lash, 2005). Tubes in the mouth or nose have been frequently cited as one of the strongest causes of anxiety, followed by the immobility caused by tube placement. Other treatment stressors highly ranked by these patients include suctioning, pain, and thirst (Van de Leur, Zwaveling, Loef, & Van der Schans, 2003). Pain, inability to sleep, the presence of tubes in the nose or mouth, lack of self-control, and the presence of restraints were the top five treatment stressors in patients (Lusk & Lash, 2005).

Environmental Stressors. Environmental stressors encompass unfamiliar surroundings and people in an intensive care unit, the constant activity in such a unit, and also the multitude of other bothersome sights and sensations that are usually present. For example, stressors might include odd machinery with repetitious droning, disturbing alarms, loud noises, unpleasant odors, unpleasant sights and sounds, and continuous bright light, causing interruption of the circadian rhythm (Bennum, 2001; Lusk & Lash, 2005). Other investigators documented that anxiety was caused by hearing nearby caregivers talk and laugh with seemingly no concern for the patient (Jastremski, 2000; Thomas, 2003). However, problems caused by noise, unpleasant sounds, and machinery alarms might be unavoidable in many ICUs.

Level of Anxiety in Patients with Ventilator Support

The degree and duration of anxiety in patients with ventilator support, as demonstrated by each individual, varies depending on the individual's specific situation and personal characteristics (Moser et al., 2003; Sungkhaw, 2001). Anxiety is categorized into four levels of intensity: mild anxiety, moderate anxiety, severe anxiety, and panic anxiety (Shives, 2005).

1. Mild anxiety is associated with the tension of day-to-day living. During this stage the patient is alert and his or her perceptual field is increased. He or she can see, hear, and grasp more than previously. The patient can creatively cope with anxiety.
2. With moderate anxiety, a person focuses only on immediate concerns. The person blocks out selected areas but can continue to problem solve. Some symptoms, such as headaches, strong breathing, and eating disorders are present due to the anxiety.
3. In severe anxiety, a patient experiences significant reduction in the perceptual field, disorientation, lack of awareness of the environment, and inability to focus on what is really happening. A patient will feel physically and psychologically uneasy and will make attempts to reduce anxiety.
4. In panic anxiety, a person suffers loss of control, and is unable to do things with any sort of purpose. There is increased motor activity, decreased ability to relate

to others, and distorted perceptions. The person is in a state of panic, and is unable to communicate or function effectively .

When patients with ventilator support suffer anxiety, the levels usually range from moderate to severe (Chlan, 2003; Wong et al., 2001). Wong and colleagues used music as an intervention in a study on mechanically ventilated patients with primarily respiratory medical diagnoses. Each day, the patients listened, in random order, to 30 continuous minutes of music, and were then provided 30 uninterrupted minutes of rest as a control. The Chinese version of Spielberger's State-Trait Anxiety Inventory (STAI) was used to assess anxiety before and after each intervention. Assessed physiologic variables included mean blood pressure and respiratory rates. The reported results of the study included a significant decrease in STAI scores after both interventions. However, music, with a reported mean STAI score difference of 14 points, was more effective than the control intervention of rest, with a reported 3.84 point mean STAI score difference. Although the physiologic variables of respiratory rate and mean blood pressure significantly decreased after both interventions, the results were not clinically significant. Overall, music may have a calming effect on mechanically ventilated patients and may assist in decreasing stressors.

Anxiety in patients with ventilator support is classified in terms of state and trait anxiety. State anxiety is conceptualized as a transitory emotional state or condition of the human organism that is characterized by subjective. It causes feelings of tension and apprehension, and results in the activation of the autonomic nervous system. State anxiety may vary in intensity and fluctuate over time. Trait anxiety refers to relatively stable individual differences in anxiety proneness. It is the difference between people with a tendency to perceive stressful situations as dangerous or threatening and those who respond to such situations with elevations in the intensity of their state anxiety reactions (Spielberger et al., 1983).

State anxiety in patients with ventilator support reflects their environment over shorter periods of time and from situation to situation. State anxiety may be caused by the environment of an intensive care unit, with its highly technological machines and monitoring devices (M. B. Yagan, White, & Staab, 2000). Therefore, such patients may feel higher anxiety compared to patients not on ventilator support. In contrast, trait anxiety in patients with ventilator support is individually-based, and is not dependent on specific behaviors to or responses in specific situations. In the ventilator support situation, patients will probably feel some anxiety regardless of other conditions.

Anxiety in patients with ventilator support generally is considered to be state anxiety. It is caused by responses to some threats related to the particular condition and treatment of the patient. Those patients manifest anxiety with feelings of tenseness and nervousness, and with restlessness or agitation. The complexity of patients' illnesses in relation to their medical conditions and the environment may result in diverse expressions of anxiety. Similarly, Moser and colleagues (2003), in their study of anxiety assessment and management in critical care nursing, found that the physical manifestations of many disease states can mimic anxiety behaviors.

Influencing Factors on Anxiety Level in Patients with Ventilator Support

There are a number of factors that contribute to anxiety in patients with ventilator support. The results of some studies showed that factors contributing to anxiety in patients with ventilator support include physical discomfort, unfamiliar environments, altered communication patterns, unfamiliar procedures, and uncertain outcomes. The degree of anxiety level exhibited by patients with ventilator support can depend on gender, age, need for ventilator support, length of time on ventilator support, and biological factors.

Sex. Sex has been revealed to have a connection with anxiety in several studies. Mitchell (2003) stated that anxiety was higher in female patients and novice patients. Female and novice patients were observed to experience greater anxiety than male patients, although they did not show significantly different levels. Obviously, gender cannot be changed. Women are somewhat more open emotionally than men. Even among women who face highly stressful situations in their lives, the risk of heart disease remains considerably lower than men. The bulk of research on psychological factors in heart disease has focused on men rather than women. Therefore, their physiological reactions to anxiety tend to be less intense (Kelly, 1980).

In a different study on sex and anxiety in ventilated patients, Chlan (2003) found that the mean state anxiety score among female patients was 49.6 (SD = 13.2) with a range of state anxiety inventory scores from 22 to 78, while the mean state anxiety score in male patients was 48.7 (SD = 11.4) with a range in state anxiety inventory scores from 24 to 79. This indicates that the experience of receiving ventilator support resulted in moderate anxiety among both female and male patients. Thus, based on this study, it can be assumed that sex is not likely directly linked to anxiety in patients with ventilator support.

Age. Age differences have a profound effect on the management of anxiety in patients. Anxiety is most frequently experienced in children and elderly people. Among the causes of anxiety are fear of dependency, illness, and loss of friends and home. In elderly people, anxiety is associated with agitation, early dementia, chronic illness, and, ultimately, death (Barnason, Zimmerman, & Nieveen, 1995).

Some studies have shown that age can influence anxiety in patients with ventilator support (Dileo et al., 2008; McKinley, Stein-Parbury, Chehelnabi, & Lovas, 2004). The researchers found anxiety in not only young patients but also in middle-aged patients, particularly in females between 30 to 59 years of age who received ventilator support. They also found that elderly patients have higher anxiety scores than younger patients in intensive care who are receiving ventilator support

Indication of Using Ventilation Support. Ventilator support is a common method of respiratory support. It is used in patients with respiratory failure or those who require respiratory support during critical care. There are indications that ventilator support for patients creates state anxiety. In 2003, Chlan studied descriptions of anxiety levels by examining individual differences (n = 200) and found that the primary medical diagnosis categories were respiratory problems (n = 31%, mean anxiety = 50.5), abdominal or spinal surgery (13%, mean anxiety = 46.7), CABG or valve repair surgery (n = 41%, mean anxiety = 49.2), transplantation (n = 13.5%, mean anxiety = 48.0), and “other” medical diagnoses (n=22%, mean anxiety = 49.5). The results indicated that patients who receive ventilator support primarily for respiratory problems may be more anxious than those with other medical problems on ventilator support (e.g., surgery cases, sepsis, myocardial infarction, congestive heart failure).

Another group of investigators studied 52 patients with chronic obstructive pulmonary disease who used ventilator support and who often experienced dyspnea and anxiety. The experimental group received daily acupressure therapy and massage treatment for 10 days. Patients in the comparison group received massage treatment and handholding therapy. The primary outcome measures included the visual analogue scales for dyspnea and anxiety, and the physiological indicators of heart rate and respiratory rate. Data were collected every day: during the baselining process (day 1), during the treatment (days 2–10), and during follow-up (days 11–17). The results of the study found that levels of anxiety, as measured by the VAS (0–100) at the baseline, were measured at 70.73 (SD = 11.73) for the experimental group and 72.54 (SD = 11.73) for the comparison group, which indicated that patients using mechanical ventilation had high levels of perceived anxiety. There was no statistically significant difference between groups at the baseline (t = 0.61, p = 0.54). In the experimental group, anxiety levels gradually decreased from day 2 until day 12, but then gradually increased during the follow-up period (Shiow-Luan, Juei-Chin, Kuan-Chia, & Ue-Lin, 2005).

Patients' apprehension about their underlying health problems can also influence anxiety levels. Factors that may contribute to one's need for ventilator support usually involve major diseases of the respiratory tract, such as pneumonia, chronic obstructive pulmonary disease, and lung cancer (Chlan, 2003). Furthermore, the physical manifestation of many disease states can mimic anxiety behaviors. Given these circumstances, it may be that patients with ventilator support manifest anxiety in widely diverse ways (Moser et al., 2003).

Lengths of Ventilator Support. Regardless of the lengths of time patients receive ventilatory support, they generally report experiencing moderate anxiety, even after just six days (Chlan, 2003), indicating that anxiety control requires continuous nursing attention regardless of the length of time a patient is on ventilator support. Chlan categorized the lengths of ventilator support treatment in that study as follows: less than 5 days, 6 to 21 days, 22 or more days, and chronic (receiving ventilation in place of residence before current hospitalization). Chlan, then, reported that patients receiving ventilator support for 22 or more days had to have the highest levels of anxiety. However, there is, in general, wide variability in the length of ventilator support time. Thus, higher levels of anxiety may be attributed to other factors, such as illness severity or weaning difficulty related to severe dyspnea. This requires further investigation.

Biological Factors. Patient responses to anxiety experiences during illness may have deleterious effects on the patients, potentially exacerbating pathological conditions and increasing the complexity of patient care. The underlying disease, hospitalization, and alteration in circadian rhythms can easily disrupt the lives of patients with ventilator support. Circadian rhythm refers to the biological cycles which last about 24 hours, or one day. Depending on the underlying disease, a patient's circadian rhythms can change (Hartshorn, Lamborn, & Noll, 1993).

The Circadian Cycle is controlled by a region of the brain known as the hypothalamus, which is the master centre for integrating rhythmic information and establishing sleep patterns. Within the Circadian (24-hour) Cycle, a person usually sleeps approximately 8 hours and is awake 16 hours. During the wakeful hours, mental and physical functions are most active and tissue cell growth increases. During sleep, voluntary muscle activities nearly disappear and there is a decrease in metabolic rate, respiration, heart rate, body temperature, and blood pressure. The activity of the digestive system increases during the resting period, but that of the urinary system decreases. Hormones secreted by the body, such as the stimulant epinephrine (adrenaline), are released in maximal amounts about two hours before awakening so that the body is prepared for activity (Paul & Lemmer, 2007).

Sleep in patients with ventilator support is greatly interrupted. Such patients have been noted to awaken frequently, have little to no REM (rapid eye movement) sleep, sleep for shorter periods, and rate their quality of sleep as poor (Nancy, 2000). The impact of sleep disruption in patients with ventilator support is not fully known (Norton, 2005). However, sleep inadequacy will impact physiological readiness for weaning off ventilator support (Hampton, Griffith, & Howard, 2005). Therefore, further study of sleep deprivation is needed.

Medication Used in Patients with Ventilator Support

Clinician provides some medications for patients with ventilator support, including, sedation, analgesia, anxiolysis, and cardiovascular drugs. Causes of distress in mechanically ventilated patients include, pain, anxiety, sleep deprivation, psychosis, agitation and delirium. Drugs used to alleviate the stressors are opiates, benzodiazepam, neuromuscular blocking agents, and inhalational agents (Yagan, White, & Staab, 2002).

Sedation. Sedation is used to maintain critically ill patients in a continuous state of detachment by using long-acting sedatives, hypnotic, and analgesic drugs (Karch, 2003). Specific reasons to sedate patients who are on ventilator support include increasing tolerance to the presence of endotracheal tube, inhibiting respiratory drive, reducing anxiety, facilitating sleep, and improving synchronization with the mechanical ventilator (Yagan, et al., 2002).

Analgesia. Pain stimuli incite atecholamine release and the high circulating levels increase the overall, as well as individual organ metabolic demands and contribute to increase in blood pressure and heart rate. Patients with ventilator support require some of analgesia drug, not only to minimize the response to anxiety and stress, but also to decrease the discomfort and unpleasant experience of the presence of endotracheal tube (Sessler, 2005).

Anxiolysis. Anxiety can be considered as inevitable reaction to major stress. It is important to control anxiety in the patients with ventilator support, which in turn decreases the immune response and increases oxygen consumption, water and sodium retention, and catabolism. Anxiolytic agents may cause hypotension, but this can often be counteracted by adequate fluid therapy (Schweickert & Kress, 2008).

Cardiovascular drugs. Cardiovascular drugs are used in patients with ventilator support to control their blood pressure. Blood pressure is related to heart rate, stroke volume, and total peripheral resistance against which the heart has to push the blood. ACE (Angiotension-converting enzyme) inhibitors prevent to the conversion of angiotension I to angiotension II. Angiotension II receptor blockers prevent the body from responding to angiotension II. Calcium channel blockers interfere with the ability of muscle to contract and lead to vasodilation, and vasodilators directly cause the relaxation of vascular smooth muscle (Karch, 2003).

Bronchodilators. Bronchodilators are medications used to facilitate respirations by dilating the airways. Several of the bronchodilators are administered orally and absorbed systematically. Other medications are administered directly into the airways by nebulizer. These drugs are such as Aminophylline, Theophylline, Epinephrine, and Terbutaline (Karck, 2003)

Assessment of Anxiety Outcomes

State-Trait Anxiety Inventory (STAI)

The STAI was first developed by C.D. Spielberger and R.L. Gorsuch in 1964 to assess the state and trait anxiety of college students (Spielberger et al., 1983). Since then, it has been revised and validated, and has been extensively used in research and clinical practice for different age groups in different cultures. STAI is a self-evaluation questionnaire, comprised of two separate self-reporting scales: (1) State-Anxiety Inventory (SAI), and (2) Trait-Anxiety Inventory (TAI). The SAI Scale is used to evaluate anxiety experienced at a particular time, and it reflects a transitory emotional response to a stressful situation. In contrast, the TAI evaluates anxiety experienced in general, and reflects a stable predisposition to anxiety as determined by personality patterns (Spielberger et al., 1983).

The STAI has been well documented for its validity and reliability. Its construct validity was examined by Spielberger using 197 high school students in four different situations: normal, relaxed, exam-related, and stressful. The mean scores of the exam-related situation were reported as statistically higher than the other situations, indicating a high validity (Spielberger et al., 1983). The internal consistency estimates for the State-Anxiety Scale range from 0.83 to 0.92, and those of the Trait-Anxiety Scale range from 0.86 to 0.92. The test-retest reliability coefficients for Trait-Anxiety were high (0.73 to 0.86), while those for State-Anxiety were low (0.16 to 0.54). According to Spielberger and colleagues, the low reliability from the test-retest was expected to measure assessments of changes, such as anxiety which results from situational stress.

STAI is widely used in some research for patients with ventilator support. Some studies measured state and trait anxiety by using STAI among patients with ventilator support already done (Chlan et al., 2007; Mok & Wong, 2003; Sungkhaw, 2001; Wong, Nahas, & Molassiotis, 2001). One study (Chlan, 2003) developed a shortened State Anxiety Scale from the Spielberger SAI, with patients receiving mechanical ventilatory support. Studies by Chlan et al (1993) and Wong, Lopez-Nahas, and Molassiotis (2001) have used a shortened Spielberger state anxiety scale to measure anxiety in patients with ventilator support. In both studies, patients were alert and able to communicate by holding up fingers in response to questions. The internal consistency coefficient alphas were 0.67 and 0.72, respectively, which are less than the 0.82 originally reported for the 6-item Spielberger scale (McKinley, Stein-Parbury, Chehelnabi, et al., 2004). Although this brief scale was minimally difficult for patients with ventilator support, Chlan (2003) remained concerned about its validity for this population and recommended further work to develop an anxiety measurement suitable for patients with ventilator support.

A shortened 6-item version of the State Anxiety Inventory (SAI) was first developed by Marteau and Bekker (1992). This shortened SAI was initially developed with 200 pregnant women and used item-reminder correlations to create a scale composed of six emotional items (calm, tense, upset, relaxed, content, worried) that had the highest correlations (0.53 - 0.71). However, when it was used in patients with ventilator support, the specific items of this STAI were puzzling to them, leading to uncertainty as to how to respond to the items. For example, “I feel content” was intended to be an anxiety-absent item. Many ventilator support patients had difficulty with this item, resulting in confusion about the meaning of the item and uncertainty about how they should respond to it (Chlan, 2003). The 6-item version of the SAI was used to measure anxiety level changes in mechanically ventilated Chinese patients during music intervention studies. The internal consistency coefficient alphas were 0.67 (Chlan, 1998) and 0.72 (Wong et al., 2001).

Visual Analogue Scale (VAS)

The VAS was developed about 60 years ago. It was used to measure many types of subjective phenomena, such as anxiety, pain, and mood states (Aragon, Farris, & Jacqueline, 2002; McKinley, Stein-Parbury, Chehelnabi, et al., 2004). The analogue scale consists of a 1-100 mm line drawn on a paper with negative and positive statements about anxiety. The left side indicates no anxiety or zero anxiety, and the right side points to the highest level of anxiety. The patients were asked to show how much anxiety they felt by marking the analogue scale (Redman, 2003).

The VAS can be used to measure anxiety levels in patients with ventilator support. However, Chlan, Savik, and Weinert (2003) explained that, although VAS is easy and quick to oversee on ventilated patients, the VAS has measurement limitations. Elderly patients may have difficulty conceptualizing the abstract nature of the VAS, which brings into question the validity of those responses

(Raisin, 1997, as cited in Chlan et al., 2003). Moreover, the single item format of the VAS precludes rigorous psychometric testing to determine the reliability and validity of the instrument, resulting in a less precise measurement of anxiety (Norman & Streiner, 1994, as cited in Chlan et al., 2003). Therefore, the VAS will not be used in this study.

Anxiety Status Inventory (ASI)

The Anxiety Status Inventory was developed by Zung William in 1971 (Grimm, 1997). It consists of two parts. The first is the ASI, which is a 20-item rating scale. It evaluates the severity of anxiety symptoms on a 4-point rating scale, ranging from one, which means no anxiety, to four, which indicates severe anxiety. The second part is a self-rating anxiety scale, which is a 20-item self-reporting scale.

The ASI consists of positive and negative statements that ask respondents if they have experienced anxiety within the last week. A "1" rating means little or no time, while a "4" rating means anxiety has been experienced most or all of the time. The reliability coefficient in the study was 0.66. The concurrent validity correlations with the Taylor manifest anxiety scale were 0.33 for ASI and 0.30 for the self-rating anxiety scale. However, there is no previous study cited which used this tool to measure anxiety in patients with ventilator support.

Music and Music Intervention

Philosophical and Theoretical Effects of Music

Archeological findings show that primitive man used music as a way to "appease the gods." In the sixth century, the Greek philosopher Pythagoras, who is considered the founder of music therapy and geometry, believed that music greatly contributed to health. Pythagoras prescribed music and a specific diet to restore and maintain the harmony of the body and soul (Nilsson, 2008; White, 2000). In the mid 1800s, Florence Nightingale introduced the power of music in hospital wards to aid in the healing process of soldiers injured in the Crimean War. Nightingale also noted the effects of different types of music. She observed that wind instrument pieces with continuous sound or air generally had a beneficial effect on patients. She also observed that instruments that do not produce continuous sounds had the opposite effect. Nightingale believed it was the responsibility of nurses to control their patients' environment in order for healing to take place (Nightingale, 1992, as cited in Nilsson, 2008).

By the late 1800s, recorded music could be used in the hospital setting. During the first half of the 1900s, health care practitioners used music in conjunction with anesthesia and analgesia. The first researcher, Kane (1994), provided intra-operative music to distract patients from the horror of surgery. In 1926, a nurse named Ilsen advocated for the implementation of specific musical prescriptions or treatment regimes. She identified rhythm as the basic therapeutic element in music (Nilsson, 2008).

Music itself is defined as a complex web of expressively organized sound that contains three essential elements: rhythm, melody, and harmony (Chlan & Tracy, 1999). Rhythm is the order in the movement of music. It is the most dynamic aspect and is a key factor in selecting particular pieces of music for specific purposes. For example, body rhythms (respiration, heart rhythm, and gait) are an integral part of human life, and music can play an essential role in harmonizing these rhythms. The melody of music is related to the sequence of musical pitches and the intervals between musical tones. Pitch is a subjective aspect of sound based on the number of cycles of vibration per second; a faster vibration produces a higher pitch. The melody of a musical piece contributes to the listener's emotional response. It is dependent on the way pitches are blended together, with the resulting combination of sounds described as consonant or dissonant by listeners (Bunt as cited in Chlan & Tracy, 1999).

The harmony of music is nonverbal by nature and appeals to the right hemisphere of the brain. This hemisphere involves intuitive, creative, and imaginative ways of processing information and evokes psycho-physiological responses. It influences the limbic system, the center of emotions, feelings, and sensations (Guzzetta as cited in Chlan & Tracy, 1999). Music harmony provides activation of the brain by causing the release of encephalin and endorphin, which affects the body's natural mood, alters substances, and kills pain (Thaut as cited in Chlan & Tracy, 1999).

The Benefits of Music

A variety of clinical outcomes have been used to measure the benefits of music and the use of music as therapy (see Table 1). The predominant findings show the efficacy of music as an anxiety-reducing agent for patients in coronary care units (White, 1999), in intensive care units (Chlan, 1998; Chlan, et al., 2007; Chlan & Tracy, 1999; Mok & Wong, 2003), and those under acute care (Gagner-Tjellesen, Yurkovich, & Gragert, 2001). Published accounts indicate that music therapy is helpful for patients in dealing with the environment and in coping with critical illness. Music is unlike other interventions, such as imagery or biofeedback, in that music therapy does not require much practice and concentration by patients to be effective. Because of the passiveness of listening to music, music therapy may be an ideal intervention for some patients with low energy, particularly those on ventilator support (Chlan & Tracy, 1999).

Several studies have shown that music therapy has benefit for patients. The benefits of music therapy include for anxiety reduction (Chlan, 1995, 1998; Wong, et al., 2001), relaxation (Chlan, 1998), pain reduction (Good & Ahn, 2008; Hooi, 2007), cognitive function improvement (Goddaer & Abraham, 1994), noise buffer (Steelman, 1990), tolerance exercise (Allison & Steven, 2008), and tolerance to procedure (Mok & Wong, 2003; Broscious, 1999; Miller, et al., 1992).

Music is clearly beneficial for many hospital patients. In order to demonstrate the efficacy of music intervention for hospital patients, Evans (2001) conducted a meta-analysis on this topic. He found that music played via headphones reduced patient anxiety during normal care delivery; however, it had no impact on the anxiety of patients undergoing invasive or unpleasant procedures, such as bronchoscopy, sigmoidoscopy, or surgery with spinal anesthetic. While music also produced a small reduction in the respiratory rate during the delivery of normal care, it had no impact on the vital signs of patients undergoing procedures. These findings highlight the fact that further research is needed into many aspects of music therapy intervention. Although the evidence is limited, music also appears to improve the mood and tolerance of patients.

A systematic review by Nilsson (2008) concerning the effects of music interventions on anxiety and pain reduction indicated that music resulted in both beneficial physiological (lower vital signs, heart rate, blood pressure, respiratory rate) and beneficial psychological (lower anxiety and pain) outcomes. This systematic review shows that music interventions can have a positive effect on patient anxiety, pain, and vital signs.

In conclusion, both authors found music to be effective during many specific hospital situations and events. It is suggested that music therapy become a modality option for all patients during hospitalization. Therefore, researchers should creatively pursue situations where listening to music produces beneficial outcomes in patients during hospitalization.

Music Intervention Process

Music intervention has two branches: active and passive. In active music intervention, the utilization of instruments or one's own voice is structured to correspond to all sensory organs, so as to obtain suitable motor and emotional responses. In the passive branch, listening to specific music is done in order to relax, stimulate, or soothe the body and mind (Keegan, 2001). Accordingly, patients with ventilator support listen to music passively because of obstacles to verbal communication.

Furthermore, music intervention has the object of bringing pleasure to the human ear. Music intervention can be done by health professionals to help relax and distract patients. Evans (2002), in a meta-analysis study, promoted music as an intervention method in the context that music played for a patient during a single episode of care could produce outcomes that were achievable during that session of music.

According to Chlan (1999), there are several types of equipment necessary for implementing a music intervention process. They include a music library, headphones, and tape players. Infection control issues must be considered before the implementation of music therapy, and nurses should determine whether their patients enjoy listening to music. Patients who are intubated should be provided an adequate mode of communication, such as pen and paper or letter board, and reading glasses if needed. Patients should also be assessed for hearing impairment and/or the ability to hear music through headphones. After a nurse has determined that music intervention is appropriate for the patient, he or she can proceed in implementing the intervention. To assess if the patient is enjoying the music or not, a nurse can use the music therapy assessment and implementation tool (MAIT), which was developed by Chlan and Tracy (1999). In this study, the researcher will use part one of the MAIT tool (Table 1) in order to assess how the patients feel about the intervention, and to determine their music preferences.

Various types of music were used in previous research studies. The genre and duration of soothing music did not seem to influence the effectiveness of music intervention. These results are confirmed by a review that explored the use of music and its effects on anxiety during short waiting periods (Cooke, Chaboyer, & Hiratos, 2005). The Cochrane review found that the positive effects of music were similar in studies in which patients selected the type of music and those in which patients did not choose the type of music (Cepeda, Carr, Lau, & Alvarez, 2006). It appears that the tempo of the music is the most important factor; slow and flowing music with 60-80 beats per minute has the most positive effect on patients (Nilsson, 2008). It has been suggested in the literature that music used therapeutically should be non-lyrical, consist predominantly of low tones, be comprised mostly of strings with minimal bass, and have a maximum volume level of 60 decibels (Staum & Brotons, 2000).

Table 1

Music Therapy Assessment and Implementation Tool (MAIT)

Part 1: Patient Assessment

1. Do you like to listen to music? YES NO
2. Why do you like to listen to music? (for relaxation, stress reduction, pure enjoyment, to pass time, with exercise, for prayer, etc…)
3. What type of music do you enjoy? Check ALL that apply.
   Classical _____ Religious _____ Rock ____ Rhythm and Blues ____
   Country _____ Instrumental_____ New-Age ____ Rap ____
   Jazz _____ Reggae _____ Old-time ____ Ethnic ____
   Other (specify) _________________________ ___________________________
4. Any specific artist or instrument type you particularly enjoy?
5. Are there any types of music or music selections that you DO NOT like?

Part II: Implementation steps

1. Determine if the patient enjoys listening to music
2. Determine reason/goal for using music therapy with particular patient
3. Provide patients with music menu or suggest a tape based on assessment data
4. Determine a mutually agreeable time and length for music therapy session with the patient and/or family members
5. Complete all nursing care prior to music therapy session
6. Gather all necessary equipment (tape player, headphones, and batteries). Ensure that equipment is in good working order
7. Assist patient to a comfortable position as necessary. Assist patient to ensure equipment is in good working order
8. Ensure call-light is within reach and enhance the environment to suit the patient's wishes (e.g., draw blinds, turn off lights, close the door, etc…)
9. Post a "Do Not Disturb" sign to prevent unnecessary patient interruptions
10. Inform patient that he or she will not be disturbed during the music therapy session unless medically necessary or the patient requests attention.

Intervention evaluation:

1. Ascertain how patient feels post-music therapy session
2. Did the patient enjoy the music?
3. Determine if mutually agreeable goals were meet
4. Determine if any changes or modifications are needed for future music therapy sessions

Additional comments:

Note. From Music Therapy Assessment and Implementation Tool (MAIT). Reprinted from "Music Therapy in Critical Care: Indications and Guidelines for Intervention," by L. Chlan and M.F. Tracy, 1999, *Critical Care Nurse, 19*, p 39. Copyright by 1999 by InnoVision Communications.

Effect of Music on Anxiety Reduction in Patients with Ventilator Support

Music has virtues for anxiety reduction. With music therapy, patients enjoy the intervention more and find it beneficial.. In patients with ventilator support, several studies made on music therapy have found that music is effective in making positive changes in anxiety, vital signs (heart rate, systolic blood pressure, and respiratory rate), pain, sedation, tolerance, satisfaction, mood, and length of stay. Research findings indicate that music is a safe and effective intervention for patients with ventilator support, in particular for reducing anxiety via nonpharmacological agents. Music can be used for several purposes.

According to Cooke, Holzhauser, Jones, Davis, & Finucane (2007), the theoretical basis of music as an intervention for anxiety lies in its ability to promote relaxation through its effect on the autonomic nervous system. It is widely accepted that the auditory stimulation of music occupies a number of neurotransmitters, thereby diverting feelings of anxiety, fear, and pain, resulting in a more positive perceptual experience. The character of these stimuli determines the patients' altered feeling states, including the reduction of stress and anxiety. When he or she is listening to music, his or her awareness of the passage of time becomes hazy, since they focus on the music. This aids in relaxation.

Music has an impact on brain activity and cerebral blood oxygenation. For example, a study by Suda, Marimoto, Obata, Koizumi, & Maki (2008) was conducted on emotional responses to music in major and minor modes, which were measured with the Optical Topography (OT) system. The study demonstrated that a localized area of the brain responded to music under stressful conditions, and produced haemoglobin changes in cerebral blood oxygenation, which was detected as a focal increase. The findings suggested that the major mode of music, which induces happiness, does relieve stress effectively. This may occur because music decreases the post stress response of the hypothalamus-pituitary-adrenal axis.

The limbic system, predominantly the hypothalamus, gathers and houses neurons. When the stimulus (music) is recognized by auditory sensations, it can alter mood or emotion. While individuals often recognize at the conscious level the influence music has on mood, auditory stimuli can also penetrate the unconscious mind and promote their own changes in perception and mood (Seaward, 2002).

Music promotes relaxation through physiological and psychological entrainment (Seaward, 2002). Musical stimuli and physiological responses (heart rate, respiration rate, and blood pressure) are composed of vibrations and consist of oscillations. When using music to provoke anxiety reduction through entrainment, it is important that the music should have a tempo at or below a resting heart rate (< 80 beats per minute). Moreover, the music should have a fluid melodic movement, pleasing harmonies, regular rhythm without sudden changes, and tonal qualities (Chlan, 2009). See Table 2 for the distinctive qualities of music.

Table 2

The Distinctive Qualities of Music

Tone:	An initial sound or vibration
Pitch:	The frequency of oscillations or vibrations. The higher the pitch, the more rapid the vibrations. A high pitch is thought to produce sympathetic nervous arousal, while a low pitch is thought to be conducive to relaxation.
Intensity:	Relative loudness or amplitude of vibrations. High intensity has the effect of emotional domination and coerciveness, while low intensity is considered more tranquil and serene.
Timbre (tone color):	Timbre is what makes the same notes played on different instruments sound very different.
Harmony:	The ratio and relationship between tones (sounds) and their rhythmic patterns.
Interval:	The units of the musical scale and the vertical distance between notes, giving rise to structure of melodies and harmonies
Rhythm:	Rhythm is described as the time pattern (horizontal distance) of music that seems to elicit such strong emotional responses. The bass frequencies most influence the rhythm of music

Note. From *Managing Stress: Principles and Strategies for Health and Well-being* (p. 381), by A. Watson and N. Drury, 1987, as cited in B.L. Seaward, 2007, London: Jones and Bartlett Publisher, Inc. Copyright 2002 by the Jones and Bartlett Publishers.

A finding from the existing studies is that the optimum time for music intervention is 15-30 minutes. The duration of preoperative or postoperative music intervention ranged from five minutes to four hours, but in the majority of the studies, music intervention was conducted for 15-30 minutes (Good & Ahn, 2008; Haun, Maainous, & Looney, 2001; Masuda, Miyamoto, & Shimizu, 2005; McRee, Noble, &

Pasvogel, 2003; Saendelbach, Halm, Doran, Miller, & Gaillard, 2006). Some of studies did not report the duration of the listening time (Allen, et al., 2001; Laurion & Fetzer, 2003; Taylor, Kuttler, Parks, & Milton, 1998; Twiss, Seaver, & McCaffrey, 2006). In general, the existing studies used headphones to provide music to the patients, although one study used loud speakers (Shertzer & Keck, 2001) and two studies did not report whether headphones or loudspeakers were used (McCaffrey, 2009; Tse, Chan, & Benzie, 2005).

Another investigator explained that music has been found to significantly reduce state anxiety ratings (as measured by the Spielberger State Anxiety Inventory), when the therapy consists of 30 minutes of the patient listening to his or her preferred music (Chlan, 1998; Wong, Lopez-Nahas, & Molassiotis, 2001). Practice guidelines suggest that music intervention given twice a day for a minimum of 20 minutes can induce relaxation (Chlan, 2000). Nevertheless, there are not enough research studies to support these guidelines. The ideal dosage of music intervention is not known. Therefore, further investigation is needed to determine the appropriate frequency and length of the intervention in order to guide nurses in implementing music intervention for patients with ventilator support. In this study, the researcher alloted 20 minutes for listening to music for patients with ventilator support, twice a day.

Another concern about music intervention is adjusted volume. There is no study that explains the ideal volume of the music. Chlan and Tracy (1999) suggested that small portable cassette tape players with adjustable volume and bass controls are convenient, compact units for music intervention. However, one study reported that music volume for inducing relaxation should have a maximum volume level of 60 decibels (Staum & Brotons, 2000).

Various outcome measures were recorded in these existing studies. These included patients' anxiety, pain, and physiological responses. Mostly, the existing studies measured physiological response outcomes before and after music intervention; however, the bulk of the studies did not clearly mention when the investigator measured the outcomes. The researchers mentioned that they measured physiological responses immediately after music intervention (Good & Ahn, 2008; Haun, et al., 2001; Masuda, et al., 2005; McRee, et al., 2003; Wu & Chou, 2008). There is no standing evidence concerning the ideal measurement time for documenting physiological responses. Thus, the researcher measured physiological responses every ten minutes during the intervention.

Music Preferences

Music encompasses many styles, such as New Age, classical, orchestra, jazz, popular, and country. Music also has many forms, such as slow and relaxing or fast and arousing. For example, there are several types of classical music of varying tempos and rhythm. Typically, classical composers write three movements of varying tempos in symphonies and concertos. The andante and adagio movements are considered by most to be calming in nature. New Age music has begun to assimilate synthesized music and sounds from nature, including ocean waves, dolphins, songbirds, and babbling brooks. Although some experts think that classical music is the best for relaxation because of its consistent tone and form, an imposed choice of musical style can be bothersome to the listener (Chlan, 2003).

If music is to induce anxiety reduction, according to Seaward (2002), it should be conducive to return the body to homeostasis. This involves two criteria: the music should be instrumental or an acoustic selection with a slow tempo and the selection should be enjoyable rather than disturbing. Musicologists suggest that bass and percussion instruments parallel the strengths of physical well-being, woodwinds and strings (violins) strengthen emotional well-being, and strings (cello and piano) augment mental well-being, and synthesizers and harps nurture the soul. In addition, listeners will have a more beneficial response towards music that is most closely related to their own preferences.

Music preference is determined by culture and environment. Several studies have already been done in Western countries using classical, New Age, and jazz music (Almerud & Petersson, 2003; Angela, Chung, Chan, & Chan, 2005; Aragon et al., 2002; Barnason et al., 1995; Chlan, 1998). In Africa, Sudan uses cultural music from healing rituals for music therapy (Jones, Baker, & Day, 2004). In China, one study used Chinese and Hong Kong music to reduce anxiety in patients undergoing surgical procedures (Mok & Wong, 2003). In Malaysia, Hooi (2007) also conducted a study that used Malaysian music to reduce anxiety and pain in female patients undergoing surgical procedures. In Korea, women reported that they wanted to listen to American music as well as Korean folk songs and religious music. This study's purpose was to pilot-test the effects of music on pain after gynecologic surgery in Korean women and to compare pain relief between those who chose American music with those who chose Korean music (Good & Ahn, 2008). Accordingly, these findings support the importance cultural cues have in forming music preferences.

In order to provide patients with their music preferences, numerous studies have asked a variety of patients to pick their preferred music. These included New Age (Nilsson, Rawal, & Unosson, 2003; Nilsson, Unosson, & Rawal, 2005; Yilmaz et al., 2003), classical (Cruise, Chung, Yogendran, & Little, 1997; Lewis, Osborn, & Roth, 2004; Nilsson, Rawal, Enqvist, & Unosson, 2003; Shertzer & Keck, 2001), slow instrumental (Gaberson, 1995), piano (Lauren, 2007; McRee et al., 2003), pan flute (Ikonomidou, RehnstrBm, & Naesh, 2004) and Malay music (Hooi, 2007). Music that is preferred by its listeners will enhance its effectiveness, as compared to music in general. Because music preferences can change over time, the cycle of preference formation can involve different variables each time (Walworth, 2003). For that reason, it is important to offer patients music of different styles and forms that are culturally relevant as well as suitable to the listener. Providing an option to decide on the music, according to patients' preferences and familiarity, will further improve the effectiveness of music therapy.

Javanese Music

In Indonesia, music is a big part of culture. Among all the works of art, music is what has possibly most influenced the Indonesian tradition and culture. Indonesia has many musical forms and types. There is music that comes from traditional culture, which has dynamic nuances. The variety of music in Indonesia lends itself to be used for many purposes. The functions of music in the Indonesian community include expressions from the heart, entertainment, communication, representation of the symbolic, religious ritual, and the fostering of social relationships (Silaban, 2006).

In ancient times in the Indonesian community, music was used for religious ritual, and at the same time, to cure the sick. Others offered a religious ritual for the ill that was accompanied by music and dance to worship the Lord with prayers for the recovery of the patient. Traditional Indonesian culture involved the belief that music could cure disease. This belief was greatly embedded in animism, and later influenced by Buddhism and Hinduism during the pre-Islamic period (Suherjanto, 2004).

One famous type of Javanese traditional music is *keroncong*, which is typically associated with the creation of the Indonesian nation. *Keroncong* music has various styles. Popular songs generally have rhythms that resemble the rhythm of traditional Javanese songs or adaptations from the Javanese style with an easier beat. Another genre of Indonesian music is *dangdut*. This music is wide-spread and very familiar to Indonesians. This kind of music is more dominant than Malay rhythms (Suherjanto, 2004).

Indonesia has many genres of its traditional music. For example, *angklung*, *kacapi*, and *suling* are types of music from *Sunda*, and *gamelan* music is from Java and Bali. *Angklung*, *kacapi*, and *suling* are usually played at interludes between songs in a performance of the classical song-form *tembang Sunda*. The term refers to the two plucked string instruments and the flute. There is a higher-pitched *kacapi rincik*, a lower-pitched *kacapi indung,* and a *suling* ornamenting the melody (Department of Tourism and Indonesian Culture, 2005). However, the most popular genre is *gamelan* music from Java and Bali islands (Sumarsam, 1984).

Java, the most populated Indonesian island, is located in the south-western part of the archipelago. Java has a rich musical tradition, in addition to being a popular location for western music. One of the forms of well-known traditional music from Java is *gamelan*. *Gamelan* derives from the word *gamel*, which means to strike or to handle, and is a generic term refering to an ensemble which is comprised predominantly of percussive instruments (Sumarsam, 1984). Gamelan instruments are mostly metallophone and gong type instruments which produce tones when struck with mallets *(tabuh).* Other types of percussion instruments included in the gamelan ensemble are a wooden xylophone *(gambang)* and a set of two headed drums *(kendhang)*, which are played with the palm and/or fingers. There are a few instruments of the gamelan ensemble which are not percussion instruments; they include a two-string bowed instrument *(rebab)*, a plucked zither-type instrument *(celempung or siter),* and a bamboo flute *(suling)* (Hatch, 1979; Sumarsam, 1984).

In the traditional Indonesian perspective, the gamelan is sacred and is believed to have supernatural power. Both musicians and non-musicians are humble and respectful to the gamelan. Incense and flowers are often offered to the gamelan. It is believed that each instrument in the gamelan is guided by spirits. It is also forbidden to step over any instrument in a gamelan, because it might offend the spirit by doing so. Some gamelan are believed to have so much power that playing them may exert power over nature. Others may be touched only by persons who are ritually qualified. In Javanese gamelan, the most important instrument is the *Gong Ageng*. Javanese musicians believe that *Gong Ageng* is the main spirit of the entire gamelan (Department of Tourism and Indonesian Culture, n.d.). Although Indonesia has various kinds of ethnic music, the use of it in the health sciences has not been studied yet. The researcher used *gamelan* music to reduce anxiety in patients with ventilator support.

In conclusion, music in all its many styles can be considered a way to profoundly affect the human condition and to have a positive influence on relaxation and anxiety reduction. Music is finally being recognized scientifically as possessing a strong therapeutic quality. Music brings about helpful changes in the emotional and physical health of patients, and has the ability to provide an altered state of physical arousal and subsequent mood improvement by processing a progression of musical notes of varying tone, rhythm, and instrumentation for a pleasing effect. Entrainment theory suggests that oscillations produced by music are received by the human energy field and various physiological responses entrain with or match the oscillations of the music.

Gamelan music is a kind of Indonesian ethnic music. Gamelan music has a slow rhythm, consistent tone color, and approximately 60 – 80 beats per minute. Numerous previous studies provided a choice for patients to choose their preferred music. This study, nevertheless, offered culturally appropriate music for patients with ventilator support. Therefore, as a summary, it is important to provide music that is culturally relevant to the listeners. Various clinical studies demonstrated that, under certain conditions, music can alter psychological and physiological responses; however, the exact means to institute music as intervention are still not completely understood. Research studies highlight the need for further research and replication of studies to fully evaluate the effect of music, particularly on the impact of music on anxiety reduction in patients with ventilator support.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the design, variables, setting, population, sample size estimation, inclusion criteria, sampling procedure, instrumentation, procedure, ethical considerations, and data analysis of the research study.

Research Design

This study was a quasi-experimental study using a non-equivalent control group and a pre-test/post-test design. This study aimed to examine the effects of music on anxiety levels and physiological responses in patients with ventilator support in both the experimental group and the control group. The research design was as follows:

	Pre-test		Post-test
Control group	O_1	⟶	O_2
Experimental group	O_1	— X ⟶	O_2

O_1 refers to the baseline data (pre-test score) on anxiety level and physiological responses in patients with ventilator support.

X refers to the music intervention for anxiety reduction in patients with ventilator support.

O_2 refers to the data on anxiety level and physiological responses after music intervention (post-test score).

Variables

The independent variable in this study was music intervention and the dependent variable was anxiety in patients with ventilator support. Some confounding variables may affect the outcomes, such as sex, age, and length of ventilator support. In order to control the confounding variables, the researcher used matching technique of the samples in the experimental group and control group, based on age, sex, and length of time on ventilator support.

Setting

The study was conducted in the intensive care units (ICU) of two public hospitals in the central Java city of Semarang, Indonesia. They were Kariadi Hospital and Tugurejo Hospital. The two hospitals are tertiary and referral hospitals, which hand over critical patients who need ventilator support. The researcher got the data on such patients from these hospitals. These hospitals reported that the number of patients on ventilator support treated monthly in their ICUs is approximately 10 patients.

Kariadi Hospital is a central referral facility for all hospitals in central Java. It was built in 1951, and has 500 beds for patients. The ICU of Kariadi hospital has 15 beds. There are six beds for the Intensive Coronary Care Unit (ICCU), six beds for the Intensive Care Unit, two beds for cardiac surgery, and one bed for isolation. Each bed is furnished with a bedside monitor. At the nurse station, there is one monitor that connects with all patient monitors. There are 16 ventilators in this ICU; 14 are of the Evita-2 Dura series and two are of the Servo series. The total number of nurses in this ICU is 30; in each shift, there are six nurses who are on duty. The ratio of nurses to patients is 1:2.

Tugurejo Hospital first opened in 1952 as a leprosy hospital. Later, the government converted the hospital into a general and teaching hospital. The hospital is located to the west of Semarang city. This hospital has 300 beds, with eight ICU beds. Of these, three beds are for surgical cases, four beds are for medical cases, and one bed is for isolation. Each bed has a bedside monitor that connects with the monitor in the nurse station. There are five ventilator support units: three Servo series and two Galileo series. There are 20 nurses in this ICU; four nurses are on duty and five patients are seen in each shift, on average. The ratio of nurses to patients is between 1:1 and 1:2.

The pain medication primarily used by the two hospitals is Tramadol, which is administered by injection. In some cases morphine is used. Valium is the anti-anxiety agent that is often used by the two hospitals. The bronchodilator agents commonly used are Berotec or Aminophyline. Dopamine, Dobutamine, and Epinephrine are the inotropic agents that these hospital ICUs always use.

Population and Sample

The population in this study consisted of patients with ventilator support who were admitted to the ICUs of Kariadi Hospital and Tugurejo Hospital. The subjects of the study consisted of 40 patients with ventilator support who met the inclusion criteria and who agreed to participate.

Inclusion Criteria

The inclusion criteria for patients were as follows: (1) more than 18 years of age (18 years old or older to sign informed consent, in accordance with Indonesia law); (2) fully alert with Glasgow Coma Scale (GCS) of 15; (3) able to write and read the Indonesian language; (4) no hearing and cognitive impairments; and (5) able to hear music played from a CD player via headphones.

Exclusion Criteria

Patients with ventilator support were excluded from this study if they received (1) continuous anti-anxiety agents, (2) sedative agents, or (3) any continuous intravenous analgesia, (4) any continuous cardiovascular drugs. In this study, the researcher excluded 5 patients in the control group and 7 patients in the experimental group because they received the medication continuously, and two patients had tracheostomy procedure during the implementation of music intervention.

Sample Size

A previous study by Chlan (1998) used music to reduce anxiety in patients receiving ventilatory assistance. Chlan recruited 54 subjects and achieved a power 0.80, an effect size of .40, and a level of significance of .05 in that study. Chlan reported that subjects who received music therapy showed significantly reduced anxiety scores (M = 10.1; SD = 3.77) as compared with the control group (M = 16.2; SD = 4.10). The calculation of the effect size (*d*) in this study was as follows:

$d = M_1 - M_2 / SD_{pooled}$

where $SD_{pooled} = \sqrt{[(M_1^2 + M_2^2) / 2]}$

Where M_1: Mean of experimental group

M_2: Mean of control group

SD_{pooled}: Standard deviation of the control group and experimental group

$SD_{pooled} = \sqrt{[(3.77^2 + 4.10^2/2]}$

$= \sqrt{15.51}$

$= 3.9$

$d = M_1 - M_2 / SD_{pooled} = 10.1\text{-}16.2/3.9 \longrightarrow d = 1.53$

In a systematic review and meta-analysis, Evans (2002) evaluated the anxiety of Chlan's study in patients with ventilator support. Evans found that the result of the standardized mean difference (SMD) ranged from 2.12 to -0.90 and the average effect size was 1.51. Hence, the calculation result (d = 1.53) and the meta-analysis study were quite close. According to Cohen's (1988, Table 2.4.1 on page 54), the necessary sample size for significant criterion of .05, power = .80, and effect size (d) = 1.40 was determined to be a minimum of seven subjects per group.

However, this study is a new project using different kinds of music and with a different population. Therefore, in order to ensure that the results of the study would be conclusive, the researcher took the sample size of 20 patients per group.

Sampling Procedures

The study sample was taken from the intensive care units of Kariadi Hospital and Tugurejo Hospital. The potential subjects who met the inclusion criteria were approached by a nurse to ascertain their interest in the study. The researcher, then, gave the explanation of the purpose of the study, informed consent, procedures, risks, benefits, and confidentiality. This allowed the patients to withdraw from participation at any time without penalty. Patients who agreed to participate and signed informed consent forms were assigned to either the experimental group or control group. To assign the patients to the different groups, the researcher used the matching technique of age (± 5 years old), sex (male and female), and length of time on ventilator support (± 1 day).

The patients were matched by age, gender and length of time on ventilator support, then, the first patient who met the inclusion criteria was assigned by lottery to either the control group or the experimental group. If this patient was assigned to the control group, then the next patient meeting the inclusion criteria and matching the characteristics of the first patient was assigned to the experimental group. This technique was continuously run until the researcher obtained the total number of 20 patients in the experimental group and 20 in the control group.

Instruments

The Demographic Data Questionnaire (DDQ)

The demographic data questionnaire contained either dichotomous or multiple choice questions. The DDQ was developed by the researcher in order to collect demographic data. It consisted of twelve items including, age, gender, marital status, religion, level of education, occupation, diagnosis, ventilator setting modes, numbers of days on ventilator, indication of ventilator support, patient's sleep duration, and medication used (Appendix B). These data were collected by the researcher or an assistant on the patients' medical records.

The State Inventory (SAI) and Trait Anxiety Inventory (TAI)

The full version of the SAI (20 items), which was developed by Spielberger and colleagues (1983), was shortened by Chlan (2003). The shortened SAI involves only the presence and absence of anxiety. In Chlan's study, exploratory factor-analysis was used to create a shortened, 6-item scale which accounted for 66.6 percent of the variance. The Cronbach's alpha was 0.78. The correlation between the 20-item and 6-item scale was 0.92. Generally, the shortened version of the SAI had good psychometric properties (Chlan, 2003). The anxiety-presence portion of the SAI contains three items: "I am frightened," "I am worried," and "I am nervous." The anxiety-absence portion of the SAI also consists of three items: "I am comfortable," "I am relaxed," and "I am at ease." In this study, the researcher used the shortened version of the SAI, because it was most convenient for keeping burden to a minimum for the subjects.

The total scores for the 6-item scales are the sums of the six items, and the scores can range from a minimum of 6 to a maximum of 24. The score of 6 to 11 indicated low state anxiety; 12 to 17 indicated moderate state anxiety, and 18 to 24 indicated high state anxiety. The presence of anxiety was scored as 1 for "not at all," 2 for "somewhat," 3 for "moderately," and 4 for "very much so." Likewise, the absence of anxiety was scored as 4 for "not at all," 3 for "somewhat," 2 for "moderately," and 1 for "very much so."

Because some of the subjects had vision problems or experienced energy limitations (weakness), when completing the SAI and the TAI, the researcher read each item to all subjects verbatim. To measure the anxiety levels of patients, the researcher printed out the SAI and TAI questions on A4 paper in the largest font (font

70). The large print facilitated visibility and readability for the patients so they could better read the items in the questionnaire. When the researcher read the questionnaire to the patients, the patients were the ones who provided the answers on the questionnaire.

The TAI contained 20 items and used a 4-point Likert scale, where ”1” stands for “almost never” 2 for “somewhat,” 3 for “moderately,” and ”4” for ”almost always.” The total scores were from 20 to 80. The score of 20 to 39 indicated low trait anxiety, 40 to 59 indicated moderate trait anxiety, and 60 to 80 indicated high trait anxiety.

Instruments for Physiological Measurement

Heart rate, respiratory rate, and blood pressure were recorded by noninvasive bedside monitors. They were measured at the baseline and every ten minutes of music intervention. Hearth rate is the number of heart beats per minute. Respiratory rate is the number of respirations (breaths) per minute. Systolic blood pressure and diastolic blood pressures were measured by a noninvasive automatic oscillometric blood pressure measuring device.

For each patient, the blood pressure measurements were executed using different adult cuff sizes that are based on their arm circumference. For patients with arm circumference of 22 to 26 cm, the cuff size used was 12x22 cm. For arm circumference of 27 to 34 cm the cuff size used was 6 x 30 cm. For arm circumference of 35 to 44 cm, the cuff size used was 16 x 36 cm. For arm circumference of 45 to 52 cm the cuff size used was 16x42 cm. In order to obtain the noninvasive bedside monitoring equipment, the hospital technicians helped the researcher perform calibration before conducting the study.

Experimental Instruments

The instruments needed for music intervention include music, small portable CD player, and headphones. *Gamelan* music was recorded on CD. Small portable CD players with adjustable volume and bass controls were convenient, compact units for music intervention. Providing headphones allowed the patients to experience some solitude or private time. These devices blocked out extraneous annoying noises, and no one else heard the music when headphones were used.

Validity and Reliability of Instruments

Validity

The Indonesian versions of the DDQ, SAI, and TAI were used to assess and validate after being back-translated. Back translated activities were done by two expert bilingual translators. After the instruments were back translated, the validity of the instrument was tested using face validity of 10 patients who met the inclusion criteria in a pilot study.

The *gamelan* music was validated by two experts in music. The first expert was a lecturer in the Faculty of Liberal Arts, Prince of Songkla University, Thailand. Another expert was a lecturer in the Faculty of Art, Solo, Indonesia. The validity test included tone, timbre, pitch, harmony, intensity, rhythm, interval, and volume. The result of the validity of the gamelan music showed that it had consistent tone color (F, B6-A#, Cm-G#), slow rhythm (andante to moderato), low amplitude, and 60 decibel of volume. Nilsson (2008) recommended that music intervention in clinical practice should be slow, approximately 60 to 80 beats per minute.

Reliability

The SAI and TAI were tested for internal consistency reliability. To test the internal consistency of the SAI and TAI, the researcher used 10 patients who met the inclusion criteria in a pilot study. The results showed that the SAI and the TAI were reliable with alpha of .88 and .86, respectively, in 10 patients, whereas, of .88 and .85 for SAI and TAI, respectively, in 40 patients.

In order to keep the quality of bedside monitors, the technicians in the hospitals do calibration of the monitors every month. Therefore, the monitors are reliable to measure the physiological responses. The researcher also asked the technicians in those hospitals to check the calibration of the monitors before conducting the study.

Translation of Instruments

The self-report instruments, including the DDQ, SAI, and TAI, were originally developed in the English language. In order to ensure equivalent versions of these instruments in the Indonesian language, the researcher usede the back-translation technique. The preferred back-translation approach required at least two independent translators (Hilton & Skrutkowski, 2002). In this approach, the first translator worked independently to produce a translated version. A second translator translated the translated version back to the original language. Both translators were then consulted to identify discrepancies, and adjustments were made for inconsistencies. There was no any discrepancy meaning in the SAI after being back translated, however, there were two items of TAI translated by the translators that differed in meaning.

In the discussion with the translators, it was identified that most challenges were related to translating the words “pile up” and “content”. There was no real translation in Indonesian language for these two words. In fact, Indonesian speaking people often use the word “pile up” as *sumpek*, *penat, menumpuk,* or *melamun*, also various meanings of expressions to describe it. The word “content” could function as verb, noun, or adjective, then the expressions that were used to say the word were also different. Indonesian meaning of the word “content” is *berisi, memuaskan, menyenangkan* (as verb), *kadar, rasa puas,* or *daya muat* (as noun), *puas, senang hati* (as adjective). After discussing, the two translators and the researcher agreed that the researcher used *sumpek* for the word “pile up” and *senang hati* for the word “content”.

Pilot Study

A pilot, or feasibility, study is a small experiment designed to test logistics and gather information prior to a larger study, in order to improve the later study’s quality and efficiency (Altman et al., 2006). The purposes of a pilot study are to determine the feasibility of the proposed study’s intervention and also to determine the feasibility of its administration of translated instruments, including their reliability and validity. The number of subjects in the pilot study was 10 patients. The patients with ventilator support used in the pilot study were not included in the sample of the main study.

Data Collection Procedures

Data collection was conducted at Kariadi Hospital and Tugurejo Hospital, in Indonesia, between September to December 2009. The steps taken in the data collecting were as follows:

Preparation Phase

The preparation phase consisted of the following steps: (1) obtaining official approval from the Faculty of Nursing of Prince of Songkla University, (2) acquiring official permission for data collection from the directors of both hospitals, (3) informing the head nurses and staff in the ICUs of both hospitals about the objectives of the study, (4) recruiting one research assistant who has at least a bachelors degree in nursing and has experience in caring for patients with ventilator support, and (5) conducting training for the research assistant.

The research assistant training process consisted of four steps. In step one, the researcher discussed the definitions of anxiety, music intervention, and physiological response, and pointed out the main variables in the study. In step two, the researcher provided the assistant with a study manual to cover the research procedure. In step three, the researcher provided examples of situations (e.g., a patient provides a wrong numerical score for a questionnaire) in which it might not be appropriate to score the anxiety level of the patient directly, and where the assistant may have to get more involved with the patient. In step four, the researcher evaluated the assistant periodically to ensure adherence to the session of music intervention.

Implementation Phase

Every day the researcher and research assistant arrived at the hospitals and obtained permission from the head nurse. Then, potential patients who met the inclusion criteria were first approached by their nurses who ascertained their interest to participate. After informed consent was obtained, the purposes of the study were explained to each potential subject. The informed consent was read by the researcher or research assistant. All physiological responses (heart rate, respiration rate, and blood pressure) were measured with subjects in the semi-Fowler's position, with the head of the bed raised approximately 30 degrees.

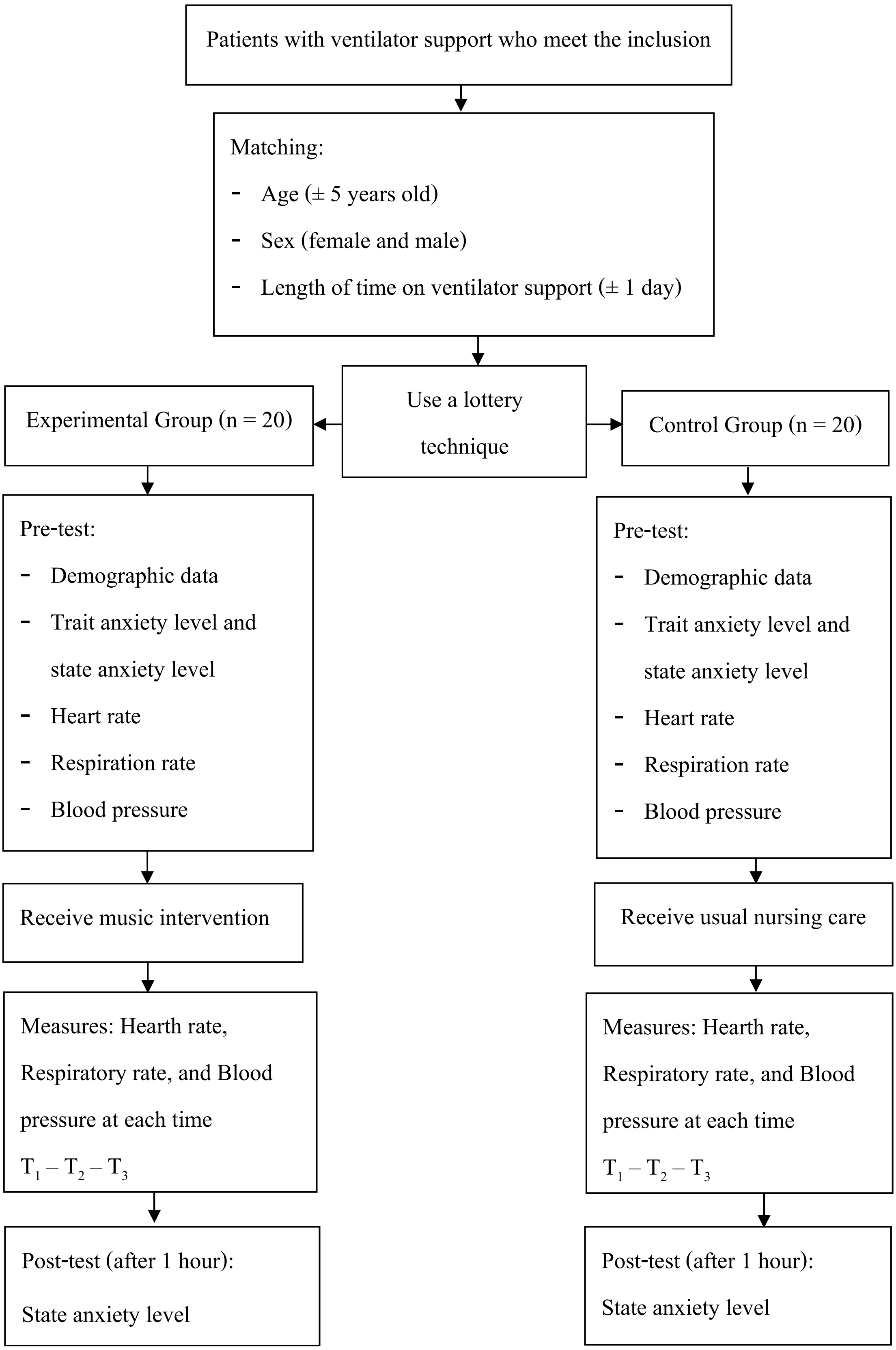
The demographic data were collected 15 minutes prior to music intervention, including the physiological responses. Patients were asked to complete the SAI and the TAI questionnaires. Next, each subject was instructed to lie quietly with his or her eyes closed, to rest, and to listen to the music being played. The environment was modified to enhance this study, by closing the doors and the curtains, providing comfortable positions, and putting up a "do not disturb" sign. Before the implementation of the study, the subjects in both groups received necessary nursing interventions, including bed making, blood taking, airway suctioning, and chest physiotherapy

Patients in the experimental group used a CD player and headphones to listen to a 20-minute uninterrupted recording of gamelan music. The environment was also enhanced to promote rest and relaxation identical to the control condition, with the researcher beside the patients to record the physiological measures. Physiological responses were observed at three time points, before intervention (T_1), of 10 minutes music intervention (T_2), and at the end of the 20-minute music intervention (T_3).

Finally, anxiety levels of subjects in the experimental group were measured one hour after the intervention (Figure 2).

The researcher collected the data from the control group in several steps. First, demographic data and physiologic responses (heart rate, respiration rate, and blood pressure) were collected 15 minutes before the intervention. Patients were also asked to complete the SAI and the TAI questionnaires. Second, music intervention was not given to the control group, but the patients got their usual activities without intervention or environmental manipulation by the researcher. Third, physiological responses were measured at time point of T_1, T_2, and T_3. Finally, anxiety levels were measured one hour later (Figure 2). For the subjects in the control group who wanted to listen to music, music intervention was provided after the post-test.

Figure 2 Study Procedures



Ethical Considerations

In regard to the rights of human subjects, the Ethic Research Committee, Faculty of Nursing, Prince of Songkla University approved this research proposal. The researcher requested a permission letter for data collection from the Faculty of Nursing, Prince of Songkla University, and it was sent to Kariadi Hospital and Tugurejo hospital. After obtaining this approval, the researcher met with the head of the research division as well as the head nurse of the intensive care unit of each hospital to explain the objectives of the study.

Patients who agreed to participate in this study were informed that they would be assigned into one of the two groups: the experimental group or the control group. The subjects received all information related to the procedures for this study. They were assured that their identities were confidential. All data were kept in secrecy and destroyed after the completion of the study. Patients were able to ask any questions about this study and have the right to withdraw from the study at anytime. Patients were able to communicate with the researcher with a pen and paper board when the researcher gave the explanation of informed consent. They were notified that there was minimal risk involved. The researcher pointed out that completing the questionnaire might make the patients tired. When a patient became tired, he or she could opt to complete the questionnaire at a later time.

Data Analysis

Frequencies and percentages were used for the demographic characteristic analysis. Mean and standard deviation were used to analyze the mean scores of state anxiety before and after intervention, for both experimental group and control group. Data were computed with descriptive statistics, including age, gender, marital status, religion, level of education, occupation, numbers of days on ventilator support, ventilator setting modes, patients' sleep duration and medication used. Chi-square test and Fisher's exact test were used to determine the significance of demographic characteristics and clinical characteristics of the subjects in the experimental group and in the control group.

The assumptions of normality and homogeneity of variance for inferential statistics variables were checked before the appropriate statistical analysis was performed. Independent *t*-test was used to detect significant difference at baseline for trait anxiety, state anxiety, and physiological responses. For the hypothesis testing of state anxiety score differences and physiological responses differences between the experimental group and the control group, the researcher used independent *t*-test. For the hypothesis testing of state anxiety score differences and physiological responses differences within group, the researcher used paired sample *t*-test. The level of significance was set at $p < .05$ for state anxiety score comparison.

For the physiological measures, repeated measures ANOVA was intially planned, however, the assumption of homogeneity of variance-covariance matrices (Box's M test) was violated. Therefore, the separated pairs for time difference were analyzed using paired *t*-test and a significance level of $p \leq .01$ was used to reduce type I error.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents and discuses the research findings of the study. The results are presented in three parts: (1) demographic and clinical characteristics, (2) anxiety score between and within the two groups, and (3) physiological responses (systolic blood pressure, diastolic blood pressure, heart rate, and respiratory rate) between and within the two groups.

Results

Demographic Characteristics

More than half of the subjects in this study were female (60% in the experiental group and 55% in the control group). Initially, the researcher did match of sex in this study; however, one subject in the control group was excluded because of critical condition. Then, the researcher got a new patient, but the patient was not match with sex, but the patient met inclusion criteria. Eventually, the researcher did not get the same number of sex in both groups. The mean age of the subjects in the experimental and control groups 45.25 years (SD = 13.73) and 47.50 years (SD = 13.04), respectively. More than half the subjects in both groups were married (65% in the experimental group and 70% in the control group). Most of the subjects in both groups had university level education (75% in the experimental group and 65% in the control group). The subjects in the experimental group mostly worked in either government or non government organizations (60%), whereas 50% of the subjects in the control group were retiree or housewives. There were no statistically significant difference in demographic characteristics of the subjects between the experimental group and control group.

Table 3

Demographic Characteristics of the Experimental Group and of the Control Group (N = 40)

Characteristics	Experimental Group (n=20)		Control Group (n=20)		χ^2	*p*
	N	%	N	%		
Sex					0.10^a	.74
Male	8	40	9	45		
Female	12	60	11	55		
Age (M = 46.38, SD = 13.26, min-max = 18-63 years)					0.89^b	.79
18-33 yr (young adult)	4	20	3	15		
34-59 yr (middle-aged)	14	70	13	65		
60-80 yr (elderly)	2	10	4	20		
Marital Status					0.32^b	1.00
Single	4	20	3	15		
Married	13	65	14	70		
Separated	3	15	3	15		
Religion					1.34^b	1.00
Muslim	18	90	18	90		
Christian	1	5	2	10		
Buddhist/Hindu	1	5	0	0		
Level of Education					0.77^b	.87
Elementary to junior high school	3	15	5	25		
Senior high school	2	10	2	10		
University	15	75	13	65		

Note. a = Chi Square, b = Fisher's exact test

Table 3 (continued)

Characteristics	Experimental Group (n=20)		Control Group (n=20)		χ^2	p
	N	%	N	%		
Occupation					1.88[b]	.48
Student	2	10	2	10		
Government/non government	12	60	8	40		
Retired/housewives	6	30	10	50		

Note. a = Chi Square, b = Fisher's exact test

Clinical Characteristics

Nearly half of subjects' health status was post operation (40% of the experimental group, 45% in the control group). BiPAP was the common mode of ventilator used in the experimental group (50%), and CPAP mode was the common mode of ventilator used in the control group (35%). Mostly, indication of ventilator used in both groups was severe dyspnea (60% of experimental group, 55% of control groups). The mean number of days on ventilator support in the experimental group and control group were 4.70 days (SD =1.84) and 5.15 days (SD = 2.54), respectively. The duration of patients' sleep at night in the experimental group and control group were 1.50 hours (SD = 0.51) and 1.30 hours (SD = 0.57), respectively. Some subjects had taken medication such as analgesic drugs (35% of experimental group, and 35% of control group) or cardiovascular drugs (20% of experimental group, and 30% control group) before participating in this study. There was no statistically significant difference in clinical characteristics of the subjects between the experimental and control groups (Table 4). In addition, all subjects were receiving pressure support (8 to 20 cmH_20) and positive end-expiratory pressure (3-12 cmH_20). The oxygen concentration given to the subjects ranged from 30% to 60%.

Table 4

Clinical Characteristics of the Experimental Group and the Control Group (N=40)

Characteristics	Experimental Group (n = 20)		Control Group (n = 20)		χ^2	*p*
	N	%	N	%		
Health problem/status					0.54[a]	.54
Pulmonary diseases	3	15	5	25		
Cardiovascular diseases	3	15	5	25		
Renal diseases	3	15	1	5		
Metabolic diseases	2	10	-	-		
Post-operation	8	40	9	45		
Fracture C-4	1	5	-	-		
Ventilator mode					4.58[a]	.18
BIPAP	10	50	6	30		
CPAP	6	30	7	35		
AC/CMV	3	15	-	-		
SIMV	1	5	-	-		
SIMV + PS	-	-	3	15		
Other (PAC, PCV)	-	-	4	20		
Indication of using ventilator					0.90[b]	.34
Severe dyspnea	12	60	11	55		
Respiratory failure	8	40	9	45		

Note. a = Fisher's exact test, b = Pearson Chi Square, BIPAP = Bilevel Positive Airway Pressure, CPAP = Continuous Positive Airway Pressure, SIMV = Synchronized Intermittent Mandatory Ventilation, PS = Pressure Support, PAC = Pressure Assisted Cycle, PCV = Pressure Control Volume

Table 4 (Continued)

Characteristics	Experimental Group (n=20)		Control Group (n=20)		χ^2	*p*
	N	%	N	%		
Number of days on ventilator (M = 4.92, SD = 0.34, min-max = 2-12 days)					0.00[b]	.66
1 – 6 days	17	85	17	85		
7 – 14 days	3	15	3	15		
Sleep duration (at night) (M = 1.40, SD = 0.49, min-max = 1-6 hours)					1.66[b]	.19
1 – 3 hours	10	50	14	70		
4 – 6 hours	10	50	6	30		
Medication					0.65[b]	.79
None	9	45	7	35		
Analgesic drugs	7	35	7	35		
Cardiovascular drugs	4	20	6	30		

Note. a = Fisher's exact test, b = Pearson Chi Square

The Level of State Anxiety

The state anxiety levels of the experimental group and those of the control group were majority within a moderate level (45% and 85%, respectively).

Table 5

The State Anxiety Levels of the Experimental Group and of the Control Group before Music Intervention (N = 40)

State Anxiety Levels	Experimental Group (n = 20)		Control Group (n = 20)		Interpretation
	N	%	N	%	
6 – 11	3	15	0	0	Low
12 – 17	9	45	17	85	Moderate
18 – 24	8	40	3	15	High

Baseline Parameters

Before the start of the experiment, subjects in both groups received necessary nursing interventions, including blood taking, bed making and chest physiotherapy to ensure no interruption during music intervention. Variables including baseline parameters were trait anxiety, state anxiety, systolic blood pressure, diastolic blood pressure, heart rate, and respiratory rate. A two-sample t-test independent group was performed to detect any baseline differences in each of the pretest variables. The results revealed that there were no statistically significant differences in the baseline data of trait anxiety, state anxiety, systolic blood pressure, diastolic blood pressure, heart rate, and respiratory rate between the two groups ($p >$ .05, Table 6).

Table 6

Baseline Differences of Trait Anxiety, State Anxiety, and Physiological Responses in the Two Groups (N=40)

Variable	Experimental Group (n = 20)		Control Group (n = 20)		*t*	*p*
	M	SD	M	SD		
Trait anxiety	44.34	7.35	46.15	10.10	0.64	.52
State anxiety	15.40	4.29	15.30	1.55	-0.09	.92
SBP	126.60	12.86	127.10	15.46	0.11	.91
DBP	71.05	11.83	77.20	11.20	1.70	.97
HR	103.35	17.53	108.80	19.03	0.94	.35
RR	22.45	7.72	24.05	6.53	0.70	.48

Note. Degree of freedom = 38

SBP = systolic blood pressure; DBP = diastolic blood pressure; HR= heart rate, RR = respiratory rate

Effects of Music Intervention on State Anxiety

Data were collected at two times point: before starting music intervention (pre-test) and one hour after music intervention (post-test). A two sample *t*-test was performed to detect differences on state anxiety. For comparison of between group effect on state anxiety scores after music intervention, subjects in the experimental group had significantly lower anxiety scores (M = 12.05, SD = 3.03, t = -2.75, $p < .05$) than those in the control group (M = 14.60, SD = 2.81, Table 7)

Table 7

Pre-test and Posttest State Anxiety Scores between the Experimental Group and the Control Group (N = 40)

	Experimental Group (N = 20)		Control Group (N = 20)			
State Anxiety	M	SD	M	SD	*t*	*p*
Pre-test	15.40	4.29	15.30	1,55	-2.75	.00
Post-test	12.05	3.03	14.60	2.81		

Note. Degree of freedom = 38

For comparison of within group effect on state anxiety score, subjects in the experimental group demonstrated that there was a significant difference between pretest and posttest scores on state anxiety (t = 3.44, p = .00). In contrast, subjects in the control group showed no significant difference between pretest and posttest scores on state anxiety (t = 1. 56, p = .13, Table 8).

Table 8

Pre-test and Post-test State Anxiety Scores of the Experimental Group and the Control Group (N = 40)

Groups	Pre-test M	Pre-test SD	Post-test M	Post-test SD	*t*	*p*
Experimental (n=20)	15.40	4.29	12.05	3.03	3.44	.00
Control (n = 20)	15.30	1.55	14.60	2.81	1.56	.13

Note. Degree of freedom = 38

Effects of Music Intervention on Physiological Responses

Data were collected at three time points: before intervention (T_1), at 10-minutes after the start of the music intervention (T_2), and at the end of the 20-minute intervention (T_3). The actual means and standard deviations of the physiological responses variables (systolic blood pressure, diastolic blood pressure, heart rates, and respiratory rates) of the experimental group and the control group were presented in Table 9.

Table 9

The Actual Means and Standard Deviations between the Experimental Group and the Control Group on Physiological Responses at Each Time Point (N = 40)

	Experimental Group (n = 20)		Control Group (n = 20)	
Variables	M	SD	M	SD
Systolic blood pressure				
Before intervention (T_1)	126.60	12.86	127.10	15.46
At the 10 minutes intervention (T_2)	123.80	13.65	128.90	14.34
At the end of the 20-minute intervention (T_3)	122.75	13.45	129.45	14.27

Table 9 (continued)

Variables	Experimental Group (n = 20) M	SD	Control Group (n = 20) M	SD
Diastolic blood pressure				
Before intervention (T_1)	71.05	11.83	77.20	11.02
At 10 minutes intervention (T_2)	70.20	11.59	77.95	10.29
At the end of the 20-minute intervention (T_3)	69.35	11.49	76.75	8.80
Heart rates				
Before intervention (T_1)	103.35	17.53	108.80	19.03
At 10-minutes intervention (T_2)	102.00	17.91	108.45	18.80
At the end of the 20-minute intervention (T_3)	100.10	17.50	108.20	18.17
Respiratory rates				
Before intervention (T_1)	22.45	7.72	24.05	6.53
At 10-minutes intervention (T_2)	21.35	7.66	23.95	6.22
At the end of the 20-minute intervention (T_3)	20.30	7.61	24.00	5.99

Since the assumptions of repeated measures ANOVA were not met, independent *t*-test and paired *t*-test, therefore, were used to determine mean differences of the physiological responses between and within the experimental group and the control group. The effects of music intervention on physiological responses were examined by comparing mean difference of physiological responses (systolic blood pressure, diastolic blood pressure, heart rates, and respiratory rates) at T_1 to T_2 and T_1 to T_3. Since the data of T_1 to T_2 and T_1 to T_3 of physiological responses variables had negative values; thus, the data transformation was applied to get rid of the negative numbers, by checking the lowest number and adding with the lowest number of each variable. Eventually, all values were positive, starting with zero.

Independent *t*-test, then, was used to compare the mean difference of the physiological responses at T_1, T_2, and T_3. The results revealed that the mean difference scores from T_1 to T_2 of subjects in the experimental group were significantly higher than those of the control group ($t = 3.86$, $p = .00$). In other words, the systolic blood pressure at T_2 of the experimental group was significantly lower than those of the control group (Table 9). However, for heart rates, respiratory rates, and diastolic blood pressure, the result demonstrated no significant differences from T_1 to T_2 ($p > .01$, Table 10).

Table 10

The Comparison of Mean Difference of Physiological Responses between the Experimental Group and the Control Group for T_1 to T_2 (N = 40)

	Experimental Group (n = 20)		Control Group (n = 20)			
Variables	M	SD	M	SD	*t*	*p*
Systolic BP	12.80	3.58	8.20	3.96	3.86	.00
Diastolic BP	15.85	1.39	14.25	6.95	1.01	.32
Heart rate	13.35	2.08	12.35	4.29	0.94	.35
Respiratory rate	5.10	1.02	4.10	2.42	1.69	.10

Note. Degree of freedom = 38
BP = Blood Pressure

The mean difference scores of systolic blood pressure from T_1 to T_3 of subjects in the experimental group were significantly higher than those of the control group ($t = 4.59$, $p = .00$). In other words, the systolic blood pressure at T_3 of the experimental group was significantly lower than those of the control group (Table 10). Diastolic blood pressure and heart rate at T_3 of the experimental group and the control group were not significantly different ($p > .01$). Respiratory rate showed a significant difference at $p \leq .01$ (Table 11).

Table 11

The Comparison of Mean Difference between the Experimental Group and the Control Group on Physiological Responses for T_1 to T_3 (N = 40)

Variables	Experimental Group (n = 20)		Control Group (n = 20)		*t*	*p*
	M	SD	M	SD		
Systolic BP	14.80	3.35	8.65	5.02	4.59	.00
Diastolic BP	12.70	1.68	11.45	6.19	0.87	.39
Heart rates	15.25	3.40	12.60	4.21	2.19	.03
Respiratory rates	8.15	1.66	6.05	3.13	2.65	.01*

Note. Degree of freedom = 38
BP = Blood Pressure, * = .013

The researcher performed the paired samples *t*-test to compare mean differences within experimental group at T_1-T_2 and T_1-T_3 on physiological variables. The results revealed that subjects in the experimental group had significant differences in all physiological responses from T_1 to T_2 and T_1 to T_3 ($p < .01$, Table 12).

Table 12

The Comparison of Mean Differences Scores on Physiological responses from T_1 to T_2 and T_1 to T_3 in the Experimental Group (N = 20)

	$T_1 - T_2$		$T_1 - T_3$			
Variables	M	SD	M	SD	*t*	*p*
Systolic BP	12.80	3.58	14.85	3.34	-7.42	.00
Diastolic BP	15.85	1.39	12.70	1.69	11.49	.00
Heart rate	13.35	2.08	15.25	3.40	-4.49	.00
Respiratory rate	5.10	1.02	8.15	1.66	-12.41	.00

Note. Degree of freedom = 38
BP = Blood Pressure

In contrast, subjects in the control group demonstrated that there were no statistically significant differences for systolic blood pressure, diastolic blood pressure, and heart rate ($p > .01$, Table 11). However, there was a statistically significant difference for respiratory rate ($p < .01$, Table 13).

Table 13

The Comparison of Mean Differences Scores on Physiological responses from T_1 to T_2 and T_1 to T_3 in the Control Group (N = 20)

	$T_1 - T_2$		$T_1 - T_3$			
Variables	M	SD	M	SD	*t*	*p*
Systolic BP	8.20	3.96	8.65	5.02	-0.62	.54
Diastolic BP	14.25	6.95	11.45	6.19	1.69	.10
Heart rate	12.35	4.29	12.60	4.21	-0.38	.70
Respiratory rate	4.10	2.42	6.05	3.13	-3.78	.00

Note. Degree of freedom = 38
BP = Blood Pressure

Discussion

The discussion focuses on two parts. The first part is on the characteristics of the subjects and the second part is on the assumption of hypothesis testing.

Characteristics of the Subjects

All subjects met the inclusion criteria and were assigned using the matching pair technique. The subjects matched in age, sex and number of days on ventilator. There were no significant differences between the experimental and the control group in terms of demographic and clinical characteristics.

More than half of the subjects in this study were female (60% in the experimental group and 55% in the control group). Caumo, et al (2001) found that high anxiety was associated with females. Similarly, Mitchell (2003) also found that anxiety was higher in female patients and novice patients. Chlan (2003) found both female and male patients experienced moderate anxiety when they were receiving ventilator support. Thus, based on Chlan's study, it can be assumed that sex was not likely directly linked to anxiety in patients on ventilator support. In this present study, the statistical analysis of sex characteristic showed no significant difference of sex between the experimental and the control group

The mean age of the subjects in the experimental group and in the control group were 45.25 years (SD = 13.73) and 47.50 years (SD = 13.04), respectively. In previous study, anxiety was found not only in young patients but also in middle-aged patients, particularly in females between 30 to 59 years of age who received ventilator support (Chlan, 2003).

The most common health status was post-operation. The indication of ventilator used in both groups was severe dyspnea. Amitai and Sinert (2009) found that the principal indications for ventilator support were severe dyspnea and respiratory failure. Chlan (2003) studied descriptions of anxiety level by examining the primary medical diagnosis on mechanical ventilated patients. The result revealed that patients who received ventilator support primarily for respiratory problems (e.g., surgery cases, sepsis, and myocardial infarction) had more anxiety than those who did not receive ventilator support on the same diagnosis.

BIPAP was the common mode of ventilator used in the experimental group (50%), and CPAP mode was the common mode of ventilator used in the control group (35%). The ventilator mode might relate to state anxiety level, because the ventilator mode should be matching with patients' condition. The fact that the condition of the ventilator mode setting did not match with patients' condition is able to make patients more anxious, and new problems will develop. Ventilator mode settings can produce anxiety and physiological responses because the ventilator mode settings are tailored to the underlying condition (Gehlbach & Hall, 2007). Gehlbach and Hall found that inadequacy of ventilator mode setting caused: (1) high a volume risking overinflation, inadequate minute ventilation, and respiratory acidosis; (2) low a volume risking in atelectasis, hyperventilation and respiratory alkalosis.

The mean number of days the subjects received ventilator support in the experimental group and in the control group were 4.70 days (SD = 1.84) and 5.15 days (SD = 2.54), respectively. The levels of state anxiety of patients with ventilator support of both groups were in moderate level. Regardless of the number of days on ventilator, the patients generally reported experiencing moderate anxiety, even after just six days (Chlan, 2003).

The duration of sleep at night of the subjects receiving ventilator support in the experimental group and in the control group were 1.50 hours (SD = 0.51) and 1.30 hours (SD = 0.57), respectively. Such patients have been noted to awaken frequently, have little to no REM (rapid eye movement) sleep, and sleep for shorter periods (Nancy, 2000). Sleep inadequacy will impact physiological readiness for weaning off ventilator support (Hampton, Griffith, & Howard, 2005).

Some subjects of the experimental group and of the control group had taken medication such as analgesic drugs (35% of both groups) or cardiovascular drugs (20% of experimental group, and 30% control group) four hours before participating in this study. Theoretically, the half of time reaction of the drugs was interacted in the human body within 4-6 hours (Karch, 2003). So the subjects who were included in this study received the medication 4 hours before music intervention. The action of the medication might have affected the subject's physiologic status in areas such as heart rate, blood pressure, and respiratory rate (Sessler & Wilhelm, 2008). Pain is the root cause of distress experienced by many mechanical ventilated patients (Sessler & Wilhelm, 2008), but anxiety, dyspnea, delirium, sleep deprivation, and other factors can contribute to patients' distress. Therefore, clinicians provide analgesia and sedation to ensure patient comfort and tolerance with ventilator. For cardiovascular drugs were used to maintain the cardiovascular system. The cardiovascular system is a closed system that depends on pressure differences to ensure the delivery of blood to the tissue and the return of that blood to the heart (Karch, 2003). After the implementation of Chi-square test to detect significant difference in medication use between two groups, it was revealed that there were no significant differences on medication use of both groups, between those who used medication and those who did not.

Hypothesis Testing

Hypothesis 1 and *Hypothesis 2*. Hypothesis 1 of the present study states that the level of state anxiety of the experimental group after receiving music intervention is lower than that before music intervention; whereas, Hypothesis 2 states that the level of anxiety of the experimental group after receiving music intervention is lower than that of the control group.

The results accepted the hypotheses and revealed that the subjects in the experimental group had significantly lower anxiety levels after receiving music intervention (t = 3.44, p <.05). The mean level of anxiety in the experimental group after receiving music intervention was also lower than that of the control group (t = -2.75, p > .05). Subjects in the experimental group had significantly greater reduction in state anxiety scores than those in the control group. This study was consistent with the previous studies (Chlan, 1998; Wong, Lopez-Nahas, & Molassiotis, 2001). Music intervention is a noninvasive nursing intervention that can reduce state anxiety among mechanically ventilated subjects in this study.

The reduction of state anxiety score in the subjects in the experimental group could be due to several factors. The first is that the subjects in the experimental group mostly fell asleep when the researcher played the music. It is likely that music has a hypnotic effect on patients, reducing their attention to distracting and annoying noise of the environment (Bernardi, et al., 2009). Music can assist patients to sleep (Richardson, Allsop, Coghill, & Turnock, 2007). Reducing anxiety and promoting the relaxation response may lead to improvement in sleep (Tracy, et al., 2005). The second is that music gives its effects on the body by causing it to entrain to the rhythms of the music. Music promotes relaxation via psychological entrainment. This entrainment is achieved by playing music to directly elicit relaxation in the subject (Chlan, 2009).

This study used gamelan music, an Indonesian ethnic music. This type of music has certain characteristics similar to music used in previous studies. Brandes (2009) and Buyung-Chuel (2008) found that the slow rhythm of 60 – 80 beats, minimum percussion, and no lyric to be soothing and relaxing and able to calm down emotions. *Gamelan* music could reduce patients' anxiety levels because of the familiarity of the music genre for people in Java. Their sense of familiarity stemmed from it being a much loved music, which further helped them escape to their own world. Similarly, Akombo (2002) and Jones, Baker and Day (2004) found that patients responded to the familiar and syncopated rhythms. They suggested the need to utilize musical elements that are familiar to the patients. Thus, after they finished listening to music, they might feel calm, then the anxiety score decreased.

Moreover, the decreased state anxiety score may be due to exerts of music effect on the body by having hypnotic effect, contributing to relaxation and anxiety reduction through cognitive quieting. Furthermore, music may summon memories of past experiences and associated emotional responses. When a relaxation response occurs, the anxiety levels are decreased. Decreased anxiety is accompanied by increased vagal outflow and diminished activity of the sympathetic nervous system (White, 1999, 2000).

Subjects in the control group showed decreased anxiety scores although they did not get the music intervention, but they showed no significantly lower scores than subjects in the experimental group did. The decreased state anxiety score in the subjects in the control group can be caused by the ICU's nurse that keeps maintaining an environment from noise, and serves patients well (e.g. spirituality, communication). This condition may make the patients feel comfortable, cared for, then, anxiety decreased. Fontaine, Briggs, and Smith (2001) found that the critical care environment can be designed to become more humanistic. Two studies (Alasad & Ahmad, 2004; Fontaine, Briggs, & Smith, 2001) supported that communicating with patients on ventilator can reduce their anxiety. They suggested that effective verbal communication is an essential part of caring process. However, it could be easily forgotten and was not practiced as it should be.

Hypothesis 3 and *Hypothesis 4.* Hypothesis 3 of the present study states that the physiological responses of the experimental group show significant reduction after music intervention; whereas, Hypothesis 4 states that the physiological responses of the experimental group after receiving music intervention show significantly greater reduction than those of the control group.

The subjects in the experimental group after receiving music intervention had significant difference on all physiological responses variables. The results were similar to the previous studies (Chlan, 1998; Wong, et al., 2001). They found that physiological responses of subjects in the experimental group had statistically significant decrease compared to subjects in the control group ($p < 0.1$).

There are several factors that may become the causes why the physiological responses of the experimental group showed significant reduction after music intervention. First, as the subjects in the experimental group had lower state anxiety score after receiving music intervention than before the music intervention, this may contribute to the reduction in physiological responses. Anxiety is correlated with adrenaline and nor-adrenaline excretion. Adrenaline can increase heart rate and rise in systolic blood pressure, while diastolic blood pressure is unaltered or may even fall. Noradrenaline causes a decrease in heart rate and rise in both systolic and diastolic blood pressure (Ulrica, 2008). When the patients felt relaxed and calm, the physiological responses could decrease.

Second, music relaxes anxious patients. Music can decrease systolic blood pressure, diastolic blood pressure, heart rate, and respiratory rate, myocardial oxygen demand, and improve sleep (Bernardi, et al., 2009). This intervention may enhance the environment for healing patients and music induces predictable physiological responses changes. The music employed in this study had 60-80 beats per minute or less, decreasing the chance of increasing the heart rate by entrainment. The music did not have lyrics and had a sustained melodic quality, with no strong rhythms or percussion. The music had a soothing quality because this had been shown to decrease anxiety and to improve comfort and relaxation.

In addition, the significant reduction in these variables could indicate a relaxed response. This relaxed response is attributed to the synchronization of body rhythms to the music, leading to decreased neuromuscular arousal (Seaward, 2002). Music also can be used to provide the patients with a meaningful, to alleviate boredom, and to allow patients having quiet time (Chlan, 2000).

Subjects in the experimental group had a statistical difference from T_1 to T_2 and T_1 to T_3 of systolic blood pressure ($p < .01$) compared with subjects in the control group. However, this study finding was not consistent with White's study (1999). White found that changes in the systolic blood pressure were not significant immediately or one hour after music intervention. White explained that it was because of the widespread use of cardiac medication for the participants in the study. In this present study, the significant difference of systolic blood pressure was because of the fact that the subjects in the experimental group were mostly post operative patients. They had a normal blood pressure value and they did not have disease related to the cardiovascular system.

The result showed no significant differences on diastolic blood pressure and heart rates between the two group. In contrast, the result showed that the respiratory rates had a significant difference at $p \leq .01$. The non significant diastolic blood pressure, which was found in this study, was not consistent with previous study (Wong, et al., 2001). Wong et al found that there were significant differences for mean blood pressure across the 30-minute music intervention period. Evans (2002) found music has no impact on heart rate of those undergoing invasive or unpleasant procedures. Music produces a small reduction in the respiratory rate in hospital patients but has little effect during invasive or unpleasant procedures.

The non significant decrease of diastolic blood pressure and heart rate might have been caused by several factors. First, the raw data of the subjects in both groups demonstrated that some subjects showed a normal value of the variables, and some of those did not show a normal value of the variables. Second, music might require a lot of time to work so as to promote an intermediate relaxation response, and it might take a longer time to induce therapeutic effects. In this study, the researcher offered the music intervention of 20 minute duration. It is still unknown and not well documented in the literature what the ideal duration of music intervention is for obtaining immediate optimal benefits. The majority of past studies provided single or multiple music session of 20 to 30 minute duration (Almerud & Petersson, 2003; Chlan, 1998; White, 2000; Wong, et al., 2001). Music is such a complex stimulus, and physiologic response is equally complex. It may be necessary to accurately assess the elements of the music that has the greatest effects on a patient's physiologic responses.

The indication of ventilator support may indicate insignificant statistical results in decreasing physiological responses between groups. The physical manifestation of many diseases status can mimic anxiety behavior. Given these circumstances, experts may infer that patients on ventilator support manifest anxiety in widely diverse ways (Moser, et al., 2003). Amitai and Sinert (2009) found that ventilator setting modes and indications for ventilation significantly affected respiratory rate variations, venous return and cardiac output. These effects will most frequently be seen in patients with cardiac disfunction such as myocardial infarction, pulmonary diseases and kidney disease. In addition, biological factors such as sleep may have deleterious effects on patient's physiological responses with underlying the disease.

In conjunction with the subjects in the control group demonstrated a significant difference on systolic blood pressure and respiratory rate. This may be caused by two factors. First, the subjects in the control group showed decreased anxiety scores on pretest-posttest. Similar to the experimental group, some physiological responses significantly decreased when anxiety scores reduced. Second, nursing staff at both ICUs provided good nursing service to the patients on ventilator support. The patients, then, felt better in the ICUs environment.

Although some variables of physiological responses showed the non-significant effects of music intervention for patients on ventilator support between the two groups, it could imply that music intervention may not necessarily be appropriate with physiological responses reduction in particular condition. Similarly, Evans (2002) stated that music appears to have little effect on vital sign parameters and has no impact on the vital signs of patients undergoing procedures.

Although the physiological responses were statically significant at $p < .01$ in the experimental group at T_1, T_2 and T_3, these changes were clinically insignificant; therefore, interpretation of the findings must be made with caution because of the high variability in the distribution of the mean of systolic blood pressure, heart rate, and respiratory rate. Interestingly, the mean differences and standard deviation of diastolic blood pressure of the experimental group and those of the control group showed significantly greater differences at T_1 to T_2 and T_1 to T_3, than the other physiological responses (see Table 11, 12). Physiologically, as blood is pumped from the heart into the blood vessels, enough diastolic blood pressure is created to send it to all other parts of our body. As blood vessels travel away from the heart, they branch off and gradually get smaller, just like tree branches. One branch may go to the brain, while another may go to the kidneys. Diastolic blood pressure keeps the blood flowing through all these branches so our body's cells get the oxygen and nutrients they need and waste matter can be removed (Porth, 2006). Therefore, when the patients feel relax the blood flowing through all body is smooth. In addition, neural impulses produced by music may mediate changes in blood pressure affecting release of norepinephrine from the locus sympathetic nervous system (Tang, Harms, & Vezeau, 2008).

Previously reported studies have shown evidences of blood pressure reduction after a music intervention, but the degree of changes between systolic and diastolic blood pressures varied across studies; and finding of this study was consistent with Chlan (1998) and Wong, et al (1999). Diastolic blood pressure changes frequently. Regard with, moment to moment variations in the physiological responses related to patients' condition, in particular, are regulated at levels sufficient to ensure adequate tissue perfusion (Chlan, 2000).

Another reason is as physiological responses were measured at 10-minute intervals were adopted for the whole previous study; however, it is not as accurate as continuous measurement. Another caution with respect to the interpretation of this study is that blinding of the subjects was not practical, which might potentially result in bias. Therefore, this needs to determine whether music's effects are specific to the subjects' music preferences or simply that the presence of music alone has an effect.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusions of the study that are based on the research findings and that include its strengths and limitations. Implications and recommendations are presented to suggest several further studies.

Conclusions

This quasi experimental research was designed to examine the effects of music intervention on anxiety reduction in patients with ventilator support. This study was conducted at Kariadi and Tugurejo hospitals, Semarang, Central Java - Indonesia from September to December 2009. Forty subjects were recruited for this study. A paired matching technique for age, sex, and length of time on ventilator support was used to assign the subjects to the experimental and the control groups.

The experimental group received *gamelan* music intervention for 20 minutes. Before the start of the experiment, the trait anxiety, state anxiety, and physiological responses of the subjects in the experimental group were measured as baseline parameters. The state anxiety and physiological responses of both subjects in the experimental and control groups were measured. The measurement of physiological responses was obtained at three time points. The instrument used for data collection consisted of demographic data, trait anxiety inventory, state anxiety inventory, and physiological data collection form. The physiological responses were measured using a digital bedside monitor.

Frequency, percentage, mean, and standard deviation were used to describe the subjects' demographic and clinical characteristics. Chi-square test was used to compare the significant differences between the demographic and clinical characteristics of the subjects in the experimental and control groups. The fisher exact test was used as an alternative statistical test to assume analysis of two-by-two contingency tables when expected frequencies were too small.

The results of the study revealed that subjects in the experimental group had significantly lower state anxiety scores than those in the control group. For comparison within group effects, subjects in the experimental group showed a significant difference between pretest and posttest scores on state anxiety ($p < .05$). In contrast, subjects in the control group demonstrated no significant difference in their pretest and posttest scores on state anxiety ($p > .05$). For between group effects on the physiological responses variables, the mean score of the subjects in the experimental group had a statistical difference at each time point for systolic blood pressure and respiratory rate ($p < .01$). However, there were no significant differences of diastolic blood pressure and heart rates ($p > .01$). For within group effects on the physiological responses variables, the mean score of the experimental group was significantly reduced than that of the subjects in the control group at each time point ($p < 01$).

Strengths and Limitations

This study was a quasi experimental pretest-posttest design, and matching technique. The lottery technique was used to assign the subjects to either the experimental or control group. Before the start of the experiment, the identification and examination of various confounding factors such as trait anxiety, and medications used, which could have a weighty effect on the findings, was carried out. This study used six items SAI for evaluating state anxiety. The reliability of SAI was reported to be high reliability, and had well supported validity in the Indonesian version.

In spite of these strengths, several limitations of this study were also noted including sample size, music, and study design. The sample size of this study was small. The small sample size gave effect to the performing statistical analysis in advance, and resulted in low power and low effects sizes. Thus, future studies need more sample sizes to increase the power and the effect size of the study. Another limitation was also noted as the research assistance knew this experimental study, so this can cause effect the internal validity of finding. However, this study also measured the objective data (physiological responses) to control the personal bias.

The choice of *gamelan* music may present another limitation. The *gamelan* music might be used for patients of Javanese ethnicity. The effect of the music to act as an anxiety reducing agent depended on the type of music used, patients' preferences, and their interest in music. *Gamelan* music needs to be accurately assessed as to the elements of the music that has the greatest effects on a patient's physiological responses.

The generalization of this study is limited because the data were collected in two hospitals. Conclusions and generalizations reached may be applicable only to this particular population. Another methodological issue that needs to be addressed in this study is that the subjects were not assigned randomly to groups. They were assigned to groups by matching pairs. The non-randomization of the groups limits the generalize ability of the results.

Implications and Recommendations

The research findings have clearly provided support for the use of music as an effective anxiolytic agent in intensive care population. Music can be implemented for patients with ventilator support to reduce their anxiety. The findings added knowledge to a body of accumulated data reference on research related to music intervention on anxiety reduction. It can also provide a knowledge research base for nurses or other health care professionals for future research development. The findings also suggest that music may be useful on patients with ventilator support to improve the soothing effects.

The study has recommendations for further related research. The power of music on anxiety was .70 (moderate effect) and d = .16 (small effect size). Future study needs more sample size to increase the power and the effect size of music on anxiety reduction and physiological responses. This current study needs replication in other population using the *gamelan* music genre to provide recommendations for music intervention. An area where further research is needed includes: duration of music intervention and appropriate time to listen to the music, the impact of music on patient mood and satisfaction. Since music intervention can be used in patients who have sleep deprivation, it is recommended that the effects of music on sleep quality in mechanically ventilated patients be studied. Furthermore, it is also recommended that studies on the effects of music on physiological responses by measuring other physiologic parameters such as, epinephrine, nor-epinephrine, and saliva analysis be conducted.

References

Agwu, K. K., & Okoye, I. J. (2007). The effect of music on the anxiety levels of patients undergoing hysterosalpingography. *Radiography, 13*, 122-125.

Alasad, J., & Ahmad, M. (2004). Communication with critically ill patients. *Journal of Advanced Nursing, 50*, 356-362.

Alejandra, J. F. (2007). The effect of live music on decreasing anxiety in patients undergoing chemotherapy treatment. *Journal of Music Therapy, 44*, 242-255.

Allen, K., Golden, L. H., Izzo, J. L., Jr., Ching, M. I., Forrest, A., Niles, C. R., et al. (2001). Normalization of Hypertensive Responses During Ambulatory Surgical Stress by Perioperative Music. *Psychosomatic Medicine, 63*, 487-492.

Allison, K. D., & Steven, R. W. (2008). The effects of music preference and exercise intensity on psychological variables. *Journal of Music Therapy, 45*, 114.

Almerud, S., & Petersson, K. (2003). Music therapy a complementary treatment for mechanically ventilated intensive care patients. *Intensive and Critical Care Nursing, 19*, 21-30.

Altman, D., Burton, N., Cuthill, I., Festing, M., Hutton, J., & Playle, L. (2006). Why do a pilot study. Retrieved June 9, 2009, from NC3Rs Experimental Design Working Group.

American Psychiatric Association. (2000). A psychiatric glossary. Retrieved December 20, 2008, from http://www.apa.org/journal/webref.html

American Music Therapy Association (2007). Music therapy - What you need to know. Retrieved September 5, 2008, from http://www.musictherapy.org

Amitai, A., & Sinert, R. H. (2009, May, 2009). Ventilator management Retrieved January 12, 2010, from http://www.medscape.com/public/copyright

Angela, K., Chung, Y. F. L., Chan, M. F., & Chan, W. M. (2005). Music and its effect on physiological responses and anxiety levels of patients receiving mechanical ventilation: A pilot study. *Journal of Clinical Nursing, 14*, 609-620.

Aragon, D., Farris, C., & Jacqueline, B. (2002). The effects of harp music in vascular and thoracic surgical patients. *Alternative Medicine, 8*, 52-60.

Barnason, S., Zimmerman, L., & Nieveen, J. (1995). The effects of music interventions on anxiety in the patient after coronary bypass grafting. *Heart and Lung, 24*, 124-132.

Bodman, M., & DeArment, C. (2009). Bali and beyond. Retrieved June 21, 2009, from http://www.balibeyond.com

Bennum, I. (2001). Intensive care unit syndrome: A consideration of psychological interventions. *British Journal of Medical Psychology, 74*, 369-377.

Bernardi, L., Porta, C., Casucci, G., Balsamo, R., Bernardi, N. F., Fogari, R., et al. (2009). Dynamic Interactions Between Musical, Cardiovascular, and Cerebral Rhythms in Humans. *Circulation, 119*, 3171-3180.

Brandes, V. (2009). Effects of receptive music interventions and audio therapies in the treatment of depression, burnout, and dysthymia. *The Journal of Science and Healing, 5*, 164-164.

Byung-Chuel, C. (2008). Awareness of music therapy dractices and factors influencing specific theoretical approaches. *Journal of Music Therapy, 45*, 93-110.

Caumo, W., Schmidt, A.P., Schneider, C.N, Bergmann, J., Iwamoto, C.W., Admatti, L.C., et al. (2001). Risk factors for preoperative anxiety in adults. *Acta Anesthesiology Scandinavica, 45*, 298-307

Cepeda, M. S., Carr, D. B., Lau, J., & Alvarez, H. (2006). Music for pain relief. *Cochrane Database of Systematic Reviews*. Retrieved June 21, 2009, from http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD004843/frame.html

Chan, M. F. (2007). Effects of music on patients undergoing a C-clamp procedure after percutaneous coronary interventions: A randomized controlled trial. *Heart & Lung: The Journal of Acute and Critical Care, 36*, 431-439.

Chlan, L. (1998). Effectiveness of music therapy intervention on relaxation and anxiety for patients receiving ventilatory assistance. *Heart & Lung, 27*, 169-176.

Chlan, L. (2000). Music therapy as a nursing intervention for patients supported by mechanical ventilation. *American Associations Critical Care Nurse Advanced Critical Care, 11*, 128-138.

Chlan, L. (2003). Description of anxiety levels by individual differences and clinical factors in patients receiving mechanical ventilator support. *Heart & Lung: The Journal of Acute and Critical Care, 32*, 275-282.

Chlan, L. (2009). A Review of the evidence for music intervention to manage anxiety in critically ill patients receiving mechanical ventilatory support. *Archives of Psychiatric Nursing, 23*, 177-179.

Chlan, L., Engeland, W. C., Anthony, A., & Guttornson, J. (2007). Influence of music on the stress response in patients receiving mechanical ventilatory support: A pilot study. *American Journal of Critical Care, 16*, 141-145.

Chlan, L., Savik, K., & Weinert, C. (2003). Development of shortenend State Anxiety Scale from the Speilberger State-Trait Anxiety inventory (STAI) for patients receiving mechanical ventilatory support. *Journal of Nursing Measurement, 11*, 283-293.

Chlan, L., & Tracy, M. F. (1999). Music therapy in critical care: Indications and Guidelines for intervention. *Critical Care Nursing, 19*, 35-41.

Cholburi, J. S. N., Hanucharurnkul, S., & Waikakul, W. (2004). Effects of music therapy on anxiety and pain in cancer patients. *Thailand Journal Nursing Research, 8*, 173-181.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd Ed.). Hillsdale, New Jersey: Lawrence Erlbaum Associates Publisher.

Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation design & analysis issues for field settings*. Boston: Houghton Mifflin.

Cooke, M., Chaboyer, W., & Hiratos, M. A. (2005). Music and its effect on anxiety in short waiting periods: a critical appraisal. *Journal of Clinical Nursing, 2*, 145-155.

Cooke, M., Holzhauser, K., Jones, M., Davis, C., & Finucane, J. (2007). The effect of aromatherapy massage with music on the stress and anxiety levels of emergency nurses: comparison between summer and winter. *Journal of Clinical Nursing, 16*, 1695-1703.

Cruise, C., Chung, F., Yogendran, S., & Little, D. A. (1997). Music increases satisfaction in elderly outpatients undergoing cataract surgery. *Canadian Journal of Anesthesia/Journal Canadien D'anesthésie, 44*(1), 43-48.

Dahlen, I., & Janson, C. (2002). Anxiety and depression are related to the outcome of emergency treatment in patients with obstructive pulmonary disease. *Chest, 122*, 1633-1637.

Department of Tourism and Indonesian Culture (2005). The kind of music in Indonesia (Indonesian version). Retrieved May, 14, 2009, from http://www.asianclassical.org

Department of Tourism and Indonesian Culture (n.d.). *Indonesian's gamelan* (Indonesian version). Retrieved July, 2009, from http://www.seasitu.niu.edu/indonesian/budaya_bangsa/gamelan

Dhond, R. P., Yeh, C., Park, K., Kettner, N., & Napadow, V. (2008). Acupuncture modulates resting state connectivity in default and sensory motor brain networks. *Pain, 136*, 407-418.

Dileo, C., Bradt, J., & Grocke, D. (2008). Music interventions for mechanically ventilated patients (Protocol). Retrieved Agustus 2008, from http://www.thecocharanelibrary.com

Evans, D. (2002). The effectiveness of music as an intervention for hospital patients: A systematic review. *Journal of Advanced Nursing, 37*(1), 8-18.

Fontaine, D. K., Briggs, L. P., & Smith, B. P. (2001). Designing humanistic critical care environtments. *Critical Care Nurse Quarterly, 24*(3), 21 - 34.

Guetin, S., Portet, F., Picot, M. C., Pommie, C., Messaoudi, M., Djabelkir, L., et al. (2009). Effect of music therapy on anxiety and depression in patients with alzheimer's type dementia: Randomised controlled study. *Dementia and Geriatric Cognitive Disorders, 28*(1), 36-46.

Gaberson, K. B. (1995). The effect of humorous and musical distraction on preoperative anxiety. *American Peri-Operative Registered Nurse Journal, 62*, 784-788.

Gagner-Tjellesen, D., Yurkovich, E. E., & Gragert, M. (2001). Use of music therapy and other ITNIs in acute care. *Journal of Psychosocial Nursing and Mental Health Service, 39 (1),* 27-37.

Gehlbach, B. K., & Hall, J. (2007). Overview of Mechanical Ventilation. Retrieved March 18, 2010: http://www.merck.com/mmpe/sec06/ch065/ch065b.html

Gravetter, F. J., & Wallnau, L. B. (2004). *Statistic for the behavioral sciences* (6th ed.) Australia: Thomson Learning Inc.

Glas, G. (2003). A conceptual history of anxiety and depression. In S. Kasper, J. A. d. Bear & J. M. A. Sitsen (Eds.), *Handbook of depression and anxiety* (2nd ed., pp. 1-47). New York: Marcel Dekker.

Goddaer, J., & Abraham, I. L. (1994). Effects of relaxing music on agitation during meals among nursing home residents with severe cognitive impairment. *Archives of Psychiatric Nursing, 8*, 150-158.

Good, M., & Ahn, S. (2008). Korean and American music reduces pain in Korean women after gynecologic surgery. *Pain Management Nursing, 9*, 96-103.

Griez, E., & Perna, G. (2003). Anxiety disorder. In D. J. Nutt & J. C. Ballenger (Eds.), *Respiration and anxiety* (pp. 251-267). UK: Blackwell Science.

Grimm, P. (1997). Measuring anxiety. In M. Frank-Stromborg & S. Olsen (Eds.), *Instruments for clinical health-care research* (pp. 329-341). Boston, MA: Jones and Bartlett Publisher.

Guyton, A. C. (1991). *Textbook of medical physiology* (8th ed.). Philadelphia, PA: W. B. Saunders.

Hampton, D. C., Griffith, D., & Howard, A. (2005). Evidence-based clinical improvement for mechanically ventilated patients. *Rehabilitation Nurse, 30*, 160-165.

Hartshorn, J., Lamborn, M., & Noll, M. L. (1993). *Introduction to critical care nursing*. Philadelphia, PA: W. B. Saunders.

Hatch, M. (1979). Towards a more open approach to the history of Javanese music. *Indonesia, 27*, 129-154. Retrieved June 19, 2009, from http://www.jstor.org/stable/3350819

Haun, M., Maainous, R. O., & Looney, S. W. (2001). Effect of music on anxiety of women awaiting breast biopsy. *Behavioural Medicine, 27*, 127-132.

Hilton, A., & Skrutkowski, M. (2002). Translating instruments into other languages: Development and testing processes. *Cancer Nursing, 25*(1), 1-7.

Honkus, V. L. (2003). Sleep deprivation in critical care units. *Critical Care Nursing Quarterly, 26*, 179-191.

Hooi, L. P. (2007). *The effect of music intervention on anxiety and pain in female surgical patients.* Unpublished Dissertation, Prince of Songkla University, Hatyai.

Horne-Thompson, A., & Grocke, D. (2008). The effect of music therapy on anxiety in patients who are terminally ill. *Journal of Palliative Medicine, 11*, 582-590.

Ikonomidou, E., RehnstrBm, A., & Naesh, O. (2004). Effect of music on vital signs and postoperative pain. *Association of Peri-Operative Registered Nurses, 80*, 269-278.

Jastremski, C. A. (2000). Intensive care unit bedside environment: A nursing perspective. *Critical Care Clinics, 16*, 723-734.

Jeannette, A. S., & Jeanne, M. S. (2008). Music as a healing art for older adults. *Journal of Psychosocial Nursing & Mental Health Services, 46*(3), 21-30.

Jones, C., Baker, F., & Day, T. (2004). From healing rituals to music therapy: bridging the cultural divide between therapist and young Sudanese refugees. *The Arts in Psychotherapy, 31*, 89-100.

Karch, A. M. (2003). *Focus on nursing pharmacology* (2nd ed.) Philadelphia, PA: Lippincott Williams & Wilkins.

Karyadi Hospital (2005). *The development of health services in Karyadi hospital (Indonesian version)*. Semarang: Karyadi Hospital.

Keegan, L. (2001). *Healing with complementary & alternative therapies*. Albany: Delmar Thomson Learning.

Kelly, D. (1980). *Anxiety and emotions*. Springfield, IL: Charles C. Thomas Publisher.

Kindler, C. H., Harms, C., Amsler, F., Ihde-Scholl, T., & Scheidgger, D. (2000). The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concern. *Anesthesia Analgesia, 90*, 706-712.

Lauren, M. (2007). The effects of music therapy on pain. *Kentucky Nurse, 55*(3), 10-16.

Laurion, S., & Fetzer, S. J. (2003). The effect of two nursing interventions on the postoperative outcomes of gynecologic laparoscopic patients. *Journal of Perianesthesia Nursing, 18*, 254-261.

Lewis, A. K., Osborn, I. P., & Roth, R. (2004). The Effect of hemispheric synchronization on intraoperative analgesia. *Anesthesia Analgesia, 98*, 533-536.

Lindgren, V. A., & Ames, N. J. (2005). Caring for patients on mechanical ventilation. *American Journal Nursing 105*, 50-60.

Lusk, B., & Lash, A. A. (2005). The stress response, psychoneuroimmunology and stress among ICU patients. *Dimension Critical Care Nurse, 24*(1), 25-31.

Marteau, T. M., & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). *British Journal Clinical Psychology, 31*, 301-306.

Masuda, T., Miyamoto, K., & Shimizu, K. (2005). Effects of music listening on elderly orthopaedic patients during postoperative bed rest. *Nordic Journal of Music Therapy, 14*(1), 4-14.

McCaffrey, R. (2009). The effect of music on acute confusion in older adults after hip or knee surgery. *Applied Nursing Research, 22*, 107-112.

McKinley, S., Parbury, J. S., & Chehelnabi, A. (2004). Assessment of anxiety in intensive care patients by using the faces anxiety scale. *American Journal of Critical Care, 13*, 146-152.

McRee, L. D., Noble, S., & Pasvogel, A. (2003). Using massage and music therapy to improve postoperative outcomes. *Association Peri-Operative Registered Nurse Journal, 78*, 433-447.

Mitchell, M. (2003). Patient anxiety and modern elective surgery: a literature review. *Journal of Clinical Nursing, 12*, 806-815.

Mok, E., & Wong, K. Y. (2003). Effects of music on patient anxiety. *Association Peri Operative Registered Nurse Journal, 77*, 396-410.

Moser, D. K., Chung, M. L., McKinley, S., Riegel, B., An, K., Cherington, C. C., et al. (2003). Critical care nursing practice regarding patient anxiety assessment and management. *Intensive and Critical Care Nursing, 19*, 276-288.

Nancy, S. R. (2000). Sleep in acute care settings: An integrative review. *Journal of Nursing Scholarship, 32(1)*, 31-38.

Nilsson, U. (2008). The anxiety and pain reducing effects of music interventions: A systematic review. *Association of Peri-Operative Registered Nurse Journal 87*, 780-807.

Nilsson, U., Rawal, N., Enqvist, B., & Unosson, M. (2003). Analgesia following music and therapeutic suggestions in the PACU in ambulatory surgery; A randomized controlled trial. *Acta Anaesthesiol Scandinavia, 47*, 278-283.

Nilsson, U., Rawal, N., & Unosson, M. (2003). A comparison of intra-operative or postoperative exposure to music-a controlled trial of the effects on postoperative pain. *Anesthesia, 58*, 699-703.

Nilsson, U., Unosson, M., & Rawal, N. (2005). Stress reduction and analgesia in patients exposed to calming music postoperatively: A randomized controlled trial. *European Journal of Anesthesiology, 22*, 96-102.

Norton, C. (2005). The family's experience with criticall illness. In P. G. Morton, D. Fontanie, C. M. Hudak & B. M. Gallo (Eds.), *Critical care nursing a holistic approach* (pp. 27-45). Philadelphia, PA: Lippincott William and Wilkins.

Paul, T., & Lemmer, B. (2007). Disturbance of circadian rhythms in analgosedated intensive care unit patients with and without craniocerebral injury. *Chronobiology International: The Journal of Biological & Medical Rhythm Research, 24*(1), 45-61.

Phumdoung, S., Youngvanichsate, S., Jongpaiboonpatana, W., & Leetanaporn, R. (2007). The effects of the PSU cat position and music on lenght of time in the active phase of labor and labor pain. *Thailand Journal Nursing Research, 11*, 96-105.

Polit, D. F., & Beck, C. T. (2008). *Nursing research: Generating and assessing evidence for nursing practice*. Philadelphia: Lippincott Williams and Wilkins.

Porth, C. M. (2006). *Essential of pathophysiology concept of altered health* (2nd ed.) Philadelphia: Lippincott Williams & Wilkins.

Redman, B. K. (2003). *Measurement tools in patient education* (2nd ed.). New York: Springer Publishing Company.

Rotondi, A., Chelluri, L., Sirio, C., Mendelsohn, A., Schulz, R., Belle, S., et al. (2002). Patients' recollection of stressful experiences while receiving prolonged mechanical ventilation in an intensive care unit. *Critical Care Medicine, 30*, 746 - 752.

Sadock, B. J., & Sadock, V. A. (2003). *Kaplan & Sadock's Synopsis of psychiatry: behavioral sciences/clinical psychiatry* (9th ed.). Philadelphia: Lippincott William & Wilkins.

Saendelbach, S. E., Halm, M. A., Doran, K. A., Miller, E. H., & Gaillard, P. (2006). Effects of music therapy on physiological and pschological outcomes for patients undergoing cardiac surgery. *Journal Cardiovascular Nursing, 21*, 194-200.

Seaward, B. L. (2002). *Managing stress: Principles and strategies for health and wellbeing* (2nd ed.). London: Jones and Bartlett Publisher.

Shertzer, K. E., & Keck, J. F. (2001). Music and the PACU environment. *Journal of Perianesthesia Nurse, 16*, 90-102.

Shiow-Luan, T., Juei-Chin, W., Kuan-Chia, L., & Ue-Lin, C. (2005). Effects of acupressure therapy for patients having prolonged mechanical ventilation support. *Journal of Advanced Nursing, 52*, 142-150.

Shives, L. R. (2005). *Basic concepts of psychiatric-mental health nursing* (6th ed.). Philadelphia: J.B. Lippincott.

Silaban, C. (2006). The function of Gonrang music in Simalungun's society (Indonesian version). Retrieved May 15, 2009, from http://www.silaban.net

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State Trait Anxiety Inventory (form Y) ("Self-Evaluation Questionnaire")*. Palo Alto, CA: Consulting Psychologists Press.

Staum, M. J., & Brotons, M. (2000). The effect of music amplitude on the relaxation response. *Journal of Music Therapy, 37*, 22-39.

Steelman, V. M. (1990). Intraoperative music therapy: Effects on anxiety, blood pressure. *Association of PeriOperative Registered Nurses, 52*, 1026-1034.

Suda, M., Morimoto, K., Obata, A., Koizumi, H., & Maki, A. (2008). Emotional responses to music: towards scientific perspective on music therapy. *Neuro Report, 19*, 75-78.

Suhartini (2008). Effectiveness of music therapy on anxiety reduction in critically ill patients. *Media Nurse, 2(1),* 29-34.

Suherjanto, I. (2004). Music and theater (Indonesian version). Retrieved May 5, 2009 from http://www.scribd.com/doc/musik

Sumarsam (1984). Gamelan music and the Javanese wayang kulit. In S. Morgan & L. J. Sears (Eds.), *Aesthetic tradition and cultural transition in Java and Bali* (pp. 105-116). Madison: University of Wisconsin Center for Southeast Asian Studies.

Sungkhaw, W. (2001). *The effects of providing information and relaxation technique on anxiety in weaning from mechanical ventilation.* Unpublished Thesis, Mahidol University, Bangkok.

Tang, H. Y. J., Harms, V., & Vezeau, T. (2008). An audio relaxation tool for blood pressure reduction in older adults. *Geriatric Nursing, 29*, 391-401.

Taylor, L. K., Kuttler, K. L., Parks, T., & Milton, D. (1998). The effect of music in the postanesthesia care unit on pain levels in women who have had abdominal hysterectomies. *Journal Perianesthesia Nurse, 13*, 88-94.

Thomas, L. (2003). Clinical management of stressors perceived by patients on mechanical ventilation. *Advanced Practice in Acute & Critical Care Psychosocial Issues, 14*, 73-81.

Tracy, M. F., Lindquist, R., Savik, K., Watanuki, S., Sendelbach, S., & Berman, B. (2005). Use of complementary and alternative therapies: A national survey of critical care nurses. *American Journal of Critical Care, 14*, 404 - 414.

Tse, M. M., Chan, M. F., & Benzie, I. F. (2005). The effect of music therapy on postoperative pain, heart rate, systolic blood pressures and analgesic use following nasal surgery. *Journal of Pain Palliative Care Pharmacotherapy, 19*(3), 21-29.

Twiss, E., Seaver, J., & McCaffrey, R. (2006). The effect of music listening on older adults undergoing cardiovascular surgery. *Nursing in Critical Care, 11*, 224-231.

Ulrica, N. (2008). The anxiety and pain reducing effects of music interventions: A Systematic Review. *Association of Operating Room Nurses. AORN Journal, 87*, 780-807

Van de Leur, J., Zwaveling, J., Loef, B., & Van der Schans, C. (2003). Patient recollection of airway suctioning in the ICU: routine versus a minimally invasive procedure. *Intensive Care Medicine, 29*, 433 - 436.

Walworth, D. D. (2003). The effect of preferred music genre selection versus preferred song selection on experimentally induced anxiety levels. *Journal of Music Therapy, 40*(1), 2-14.

White, J. M. (1999). Effects of relaxing music on cardiac autonomic balance and anxiety after acute myocardial infarction. *American Journal of Critical Care, 8*, 220-230.

White, J. M. (2000). State of the science of music interventions: Critical care and perioperative practice. *Critical Care Nurse Clinical North America, 12*, 219-225.

Wong, H. L. C., Lopez-Nahas, V., & Molassiotis, A. (2001). Effects of music therapy on anxiety in ventilator-dependent patients. *Heart & Lung, 30*, 376-387.

Wu, S., & Chou, F. (2008). The effectiveness of music therapy in reducing physiological and psychological anxiety in mechanically ventilated patients (Chinese version). *Journal of Nursing, 55*(5), 35-44.

Yagan, M. B., White, D., & Staab, J. (2000). Sedation of the mechanically ventilated patient. *Critical Care Nursing Quarterly, 22*(4), 90-100.

Yilmaz, E., Ozcan, S., Basar, M., Basar, H., Batislam, E., & Ferhat, M. (2003). Music decreases anxiety and provides sedation in extracorporeal shock wave lithotripsy. *Urology, 61*, 282-286.

Appendix A

RESEARCH INFORMATION SHEET

TO PARTICIPATE IN THE STUDY

My name is Suhartini Ismail; I am a master student at Faculty of Nursing, Prince of Songkla University, Thailand. I am also a nurse educator in the nursing program at Medical Faculty Medicine, Diponegoro University. I am conducting a research study entitled "The Effects of Music on Anxiety Reduction in Patients with Ventilator Support. It is expected that the findings of this study will contribute to improve the quality health care of patients with ventilator support. This study has been approved by the Institutional Review Board of Prince of Songkla University, Thailand. It also has been granted permission by research committee of the hospital. You are asked to participate in this study. If you decided to participate, I will start the following procedures:

Explanation on procedures

1. You will be assigned to either the experimental group or the control group
2. If you are in the experimental group, you will be given the music to listen during the study period.
3. If you are in the control group, you will not be given any music to listen. You will continue to receive routine nursing care from nurse. However, if you want to listen to the music, you will be provided after the end of the study period.

Evaluation and forms

1. You will be asked to fill up forms about your personal information and music liking. It will take time around 15-30 minutes.
2. You will be asked to self-rate your anxiety level for a 3-day study period.
3. At each time of evaluation, you will self rate your anxiety level before and after one hour completed the procedure.
4. You also will be given the same routine care throughout your hospital stay.

Risk and Comfort

There is no known risk related to self-rating of your anxiety level. However, there is a possibility that some of the questions asking about how you feel right now and in general relating to your ventilator support situation, in which can cause you some discomfort or fatigue. If you feel discomfort or fatigue during answering the question, you can ask or interrupt to rest a while. There is neither cost nor payment to you for your participation in this study.

Confidentiality

All information and your response in this study will remain confidential and anonymous, and will only be accessible to the researcher, research advisors, and research committee of this study. Your name or any identifying information will not be used in the reports.

Participation and withdrawal from participation

Your participation in this study is voluntary. Returning the forms given indicate that you understand what is involved and your consent to participate in this study project. You have the right to withdraw from participation in this study at any time, and no penalty will be incurred if you decide to withdraw. There will be no influence on your receiving service or any medical treatment if you withdraw from the study. If you agree to participate in this research, please kindly sign your name on the consent form.

Thank you for your kind cooperation

Suhartini Ismail
Researcher

INFORMED CONSENT FORM

Title: The Effects of Music on Anxiety Reduction in Patients with Ventilator Support

Researcher: Mrs. Suhartini Ismail
Master student, Faculty of Nursing, Prince of Songkla University, Thailand

I, ____________________________, was informed of the details of the research entitled "The Effects of Music on Anxiety Reduction in Patients with Ventilator Support", and was guaranteed that no part of my personal information and research result shall be individually exposed to the public. If any concerns or issues come up, I can discuss them with the researcher. I have the right to withdraw from this study at any time without any effects on any medical services and treatment. I am willing to participate in this research study, and hereby is my signature.

With consideration above, hereby, I decide without the force from any side, therefore I am agree/not agree* to participate as a respondent in this research.

*choose the appropriate one

Participant: ______________________

Date: ______________________

Researcher: ______________________

Date: ______________________

Appendix B

DEMOGRAPHIC DATA QUESTIONNAIRE (DDQ)	
Code: __________ Group: Experimental/Control*	Hospital*:________________
Date: __________	
Instruction: Please fill the blank and give mark (√) in the bracket appropriate to your answer where indicated. Statements marked (*) will be filled up by the researcher or data collector. Thank you.	
1. Age : .... years	
2. Gender : ( ) Female	( ) Male
3. Marital status	
( ) single	( ) divorce
( ) married	( ) widow or widower
4. Religion	
( ) Islam	
( ) Christian/Catholic	
( ) Buddha	
( ) Hindu	
5. Level of education	
( ) Elementary school	( ) bachelor
( ) Senior high school	( ) diploma
( ) Junior high school	( ) graduate school
6. Occupation	
( ) student	( ) private employee
( ) government employee	( ) retired
( ) farmer/gardener	( ) housewife
7. Diagnosis...	
8. Ventilator setting modes...	
9. Numbers of days on ventilator..	
10. Indication of ventilator support...	
11. Sleep duration..	
12. Medication used..	

Appendix C

STATE ANXIETY INVENTORY

Code*: ______ Group: Experimental/Control* Date*:________

Instruction:

A number of statements which people have used to describe you are feeling right now. Read each statement and then circle in the appropriate number to the right of the statement to indicate how you feel right now. There is no right or wrong answer, which seems to describe your present feeling best.

Responses
1 = Not at all
2 = Somewhat
3 = Moderately
4 = Very much

N0	Items	Not at all	Somewhat	Moderately	Very much
Anxiety present					
1	I feel frightened	1	2	3	4
2	I feel nervous	1	2	3	4
3	I am worried	1	2	3	4
Anxiety absent					
4	I feel ease	1	2	3	4
5	I feel comfortable	1	2	3	4
6	I feel pleasant	1	2	3	4

Appendix D

TRAIT ANXIETY INVENTORY

Code*: Group: Experimental/Control* Date*:

Instruction:
A number of statements which people have used to describe you are feeling right now. Read each statement and then circle in the appropriate number to the right of the statement to indicate how you feel right now. There is no right or wrong answer, which seems to describe your present feeling best.
Responses
1 = Not at all 2 = Somewhat 3 = Moderately 4 = Very much

N0	Items	Not at all	Somewhat	Moderately	Very much
1	I feel pleasant	1	2	3	4
2	I feel nervous and restless	1	2	3	4
3	I feel satisfied with myself	1	2	3	4
4	I feel strained	1	2	3	4
5	I wish I could be as happy as others seem to be	1	2	3	4
6	I feel like a failure	1	2	3	4
7	I am “calm, cool and collected”	1	2	3	4
8	I feel are piling up so that I cannot overcome them	1	2	3	4
9	I worry too much over something that really does not matter	1	2	3	4
10	I am happy	1	2	3	4
11	I have disturbing thoughts	1	2	3	4
12	I lack self confidence	1	2	3	4
13	I feel secure	1	2	3	4
14	I make decision easily	1	2	3	4
15	I feel inadequate	1	2	3	4
16	I am content	1	2	3	4
17	Some unimportant thought runs through my mind and bothers me	1	2	3	4
18	I take disappointments so keenly that I can’t put them out of my mind	1	2	3	4
19	I am steady person	1	2	3	4
20	I get in a state of tension or turmoil as I think over my recent concerns and interest	1	2	3	4

Appendix E

OBSERVATION FORM FOR PHYSIOLOGICAL RESPONSES

No	Time 1				Time 2				Time 3			
	SBP	DBP	HR	RR	SBP	DBP	HR	RR	SBP	DBP	HR	RR
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

Appendix F

INSTRUCTION TO PATIENT ON MUSIC LISTENING

This music session last a total of 20 minutes. It consist of 3 parts

Part 1:

Begin by allowing the music simply plays for about 5 minutes. As it plays listen and feel the music surrounding you. Allow yourself to become relax with the music.

Part 2:

The listening takes you about 20 minutes

Part 3:

The final few minutes after the music stops, allow yourself to end by relaxing and any remaining fear, worry that may you have

Procedure:

1. Gather all necessary equipment (i.e. tape player, headphones, batteries)
2. Assist patient to comfortable position
3. Inform patient that he/she will not be disturbed during the negotiated music intervention session unless medically necessary or the patient request attention
4. Assist patient to fix with the equipment operation (headphone and volume adjustment)
5. Play music
6. Read script as follow:

   Close your eyes...

   Listen to the rhythm of the music...

   Allow your breathing to follow the music...

   Allow your mind to follow the rhythm of the music...

Ending the music session:

7. Remind patient that if she/he needs to reduce her/him anxious, she/he may call ward nurse or researcher for listening to music.
8. Ascertain how patients feel post music intervention session.

Appendix G

GAMELAN MUSIC TEST

Gamelan Kebo Giro

Tone	F
Timbre	Medium
Pitch	440 Hz
Harmony	Regular and consistent tone colour
Intensity	Low amplitude
Rhythm	Andante (79)
Interval	3,4,5 (Major)
Volume	60 decibel

Gamelan Ibu Pertiwi

Tone	B^6
Timbre	Medium
Pitch	440 Hz
Harmony	Regular and consistent tone colour
Intensity	Low amplitude
Rhythm	Andante (72)
Interval	3,5, 9 (Major)
Volume	60 decibel

Gamelan Bulan Dagoan

Tone	Cm
Timbre	Medium
Pitch	440 Hz
Harmony	Regular and consistent tone colour
Intensity	Low amplitude
Rhythm	Moderato (93)
Interval	1,3,5 (Minor)
Volume	60 decibel

Hatyai, September 8, 2009
Music Composer: Dr. Komson Wongwan

GAMELAN MUSIC TEST

Gamelan Kebo Giro

Tone	F
Timbre	Medium
Pitch	440 Hz
Harmony	Regular and consistent tone colour
Intensity	Low amplitude
Rhythm	Andante
Interval	3,4,5 (*pelog*)
Volume	60 decibel

Gamelan Ibu Pertiwi

Tone	A#
Timbre	Medium
Pitch	440 Hz
Harmony	Regular and consistent tone colour
Intensity	Low amplitude
Rhythm	Andante
Interval	3,5, 7 (*pelog*)
Volume	60 decibel

Gamelan Bulan Dagoan

Tone	Cm
Timbre	Medium
Pitch	440 Hz
Harmony	Regular and consistent tone colour
Intensity	Low amplitude
Rhythm	Moderato (93)
Interval	1,3,7 (*pelog*)
Volume	60 decibel

Indonesia, August 12, 2009
Music Composer: Jujuk Eksa

VITAE

Name Suhartini Ismail

Student ID 5110420094

Educational Attainment

Degree	Name of Institution	Year of Graduation
Diploma 3	Health Department of Indonesia	1996
Bachelor of Nursing	University of Indonesia	2001

Scholarship Awards during Enrolment

2008-2010 Educational Department Scholarship, Indonesian Government

Work – Position and Address

Work position Lecturer at Nursing Program Faculty of Medicine, Diponegoro University.

Address Jalan Prof. H. Soedarto, S. H Komplek E MIPA Lt. II Tembalang, Semarang (50275), Central Java, Indonesia.

List of Publication and Proceedings

Suhartini. (2008). Effectiveness of music therapy on anxiety reduction in critically ill patients. *Media Nurse, 2(1)*, 29-34

Suhartini, Kritpracha, C. (2009). Complimentary care to reduce anxiety in patients with ventilator support. *The Malaysian Nursing Journal, 1(1)*, 16-23.