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Gamelan Music and Physiological Responses in Patients with Ventilator Support

Suhartini *, Charuwan Kritpacha **, Ploenpit Thaniwattananon **

ABSTRACT

Background: *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 explore the effects of music intervention on physiological responses for patients receiving ventilator support in intensive care units in Indonesia.*

Methods: *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). The outcome measures were physiologic responses, 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.*

Result: *The findings showed that the subjects who received music intervention demonstrated statistically significant reductions in sympathetic physiological responses ($p<0.05$). Specifically, there was a significant difference in systolic blood pressure, but there was no significant difference in diastolic blood pressure, heart rates, and respiratory rate between the two groups. In the between groups comparison, 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.*

Conclusion: *Gamelan intervention gives positive impact to patients with ventilator.*

Keywords: *Music intervention, ventilator support, physiological responses*

ABSTRAK

Musik gamelan dan responfisiologi pada pasien dengan ventilator

Latar belakang: *Musik adalah intervensi keperawatan secara non farmakologikal yang dapat digunakan secara komplementari dalam merawat pasien yang menggunakan ventilator. Riset ini bertujuan untuk mengeksplorasi efek intervensi musik dalam menurunkan respon fisiologis pasien dengan ventilator di ruang perawatan intensif di Indonesia.*

Metode: *Penelitian adalah penelitian semu dengan rancangan grup kontrol* non-equivalen, pre *dan* post *pengukuran. Ada 40 subyek penelitian yang dikelompokkan dalam grup kontrol dan grup eksperimen. Hasil yang diukur adalah tekanan darah sistolik dan diastolik, denyut jantung, dan frekuensi pernafasan, yang didapatkan dari pengukuran setiap 10 menit dalam 20 menit pemberian intervensi musik. Data diukur dengan menggunakan uji Chi-square, uji Fisher-exact, uji t-independen, dan uji t-berpasangan.*

Hasil: *Hasil menunjukkan bahwa subyek yang menerima intervensi musik secara signifikan menurunkan respon simpatetik fisiologis ($p<0,05$). Secara spesifik, ada perbedaan yang bermakna dalam tekanan darah sistolik, tetapi tidak ada perbedaan yang signifikan dalam tekanan darah diastolik, denyut jantung, dan frekuensi pernafasan diantara kedua grup. Pada kelompok kontrol, hanya tekanan darah diastolik yang menunjukkan menurunkan skor rerata dari pretes ke postes dalam grup eksperimen dan grup kontrol.*

Simpulan: *Intervensi gamelan memberi dampak positif pada pasien dengan ventilator.*

* *School of Nursing, Faculty of Medicine, Diponegoro University, Emergency and Critical Care Nursing Division, Adult Nursing Department. E-mail: titin_yayub@yahoo.com*

** *Medical Nursing Department, Faculty of Nursing, Prince of Songkla University, Thailand*

INTRODUCTION

Ventilator support is a life-saving treatment for patients who have 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.[1] Anxiety is an emotional state involving subjective feelings of tension, apprehension, nervousness, and worry.[2] Patients using mechanically-ventilated support systems often experience adverse events due to this anxiety, such as constriction of arteries and airways in the lungs.[3] Many patients have difficulty matching their own breathing patterns with ventilators, and they are apprehensive during endotracheal suctioning.[4] 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.[2]

Music intervention has been found to be effective for anxiety reduction and pain relief. The efficacy of music intervention has been studied across cultures; including in Western countries[5,6], Thailand[7], China[8,9], and Japan.[10] 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. No study in Indonesia has examined using music intervention for physiologic responses, whether among people in general or patients receiving ventilator support in particular.

Previous studies have cited the benefits of using music intervention to reduce anxiety in patients on ventilator support.[11] In some of these studies, the patients listened to western music, classical music, new age music[2], or Chinese music.[9] These types of music were used in previous studies because these genres had already been shown to have beneficial effects on the body.[12] One example is classical music, which is widely used with pregnant women to stimulate the intelligence of their unborn babies.[13] In this present study, however, the researcher used *gamelan* (read: *ga – me – lan*) music. *Gamelan* music originates from Java in Indonesia. This music is characterized by slow harmony, consistent tone color, and low pitch.[14] Based on the results of the validity test in this study, *gamelan* music have a slow rhythm, low tones, rate of 60-80 beats per minute, a medium timbre, and a volume level of approximately 60 decibels.

This study had two aims to examine within-subject effect (pretest-posttest comparison) of music intervention on anxiety and physiological responses, and to examine between-group effects (experimental and control group comparison) on anxiety and physiological responses. The researcher hypothesized that physiological responses of the experimental group, after receiving music intervention, would be lower than before music intervention. Also, the level of physiological responses of the experimental group, after receiving music intervention, would be lower than that of the control group.

METHODS

This study used two groups, pretest-posttest experimental non-equivalent design. A purposive sampling procedure was used to recruit subjects from two ICU in Indonesia. The participants consisted of 40 patients receiving ventilator support. The sample size was accounted based on power analysis by the result of standardized mean differences (SMD) and the average effects. The necessary sample size for significant criterion of 0.05, power=0.80, and effects 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 different population. Therefore, in order to ensure that the results of the study would be conclusive, the researchers took the sample size of 20 patients per group.

The inclusion criteria were: to be 18 to 60 years of age (18 years old or older to sign informed consent, in accordance with Indonesian law; patients near 60 years of age were included, provided they had no hearing impairments and were able to read); to be fully alert with a Glascow coma score (GCS) of 15; to be able to write and read the Indonesian language; to have no hearing and cognitive impairments; to be able to hear music played on a CD player via headphones. Participants were excluded from this study if they received continuous anti-anxiety agents, sedative agents, and any continuous analgesia, and continuous cardiovascular drugs.

Before conduct the real study, the researchers had already conducted the pilot study to determine the feasibility of the proposed study's intervention and to determine the feasibility of its administration of reliability and validity of instrument. All data were collected in the morning or early evening to accommodate patient and unit routines. Patients who agreed to participate in this study were informed that they were assigned into one of two groups: the experimental group or the control group. The subjects were provided all information related to the procedures

for this study, and were assured of confidentiality and anonymity. Participants were notified that there was minimal risk involved.

To assign the patients to the different groups, the researcher used the matching technique. The patients were matched by age, sex, and length of time on ventilator support, then, the first patients who met the inclusion criteria was assigned by lottery to either the control group or experimental group. If the first patient was assigned to the control group, the next patient was assigned to the experimental group. This technique was continuously run until the researchers obtained the total number of patients consecutively.

The potential subjects who met the inclusion criteria were give the informed consent who read by researcher or research assistant. Research assistant was recruited from ICU. During the data collection process, the researchers were who put the headphone to the patients' ears and anxiety measurement. Research assistant, then, noted the physiological responses by bedside monitor. For the treatment conditions, the researchers enhanced environment to promote rest by closing the door, putting up a "do not disturb" sign, and dimming the lights. Each subject was instructed to lie quietly with his or her eyes closed, to rest, and listen to the music being played.

Blood pressure, heart rate and respiratory rate were selected as variables indicative of physiological responses in anxiety. The data were recorded by noninvasive bedside monitors. Data collected at the baseline and every ten minutes intervention. The heart rate was the number of heart beats per minute. The respiratory rate was the number of respirations (breaths) per minute. Blood pressure included systolic and diastolic blood pressure measured by using a noninvasive automatic oscillometric blood pressure measuring device.

Music in this study was recorded *gamelan* music played via headphones. Subjects in the experimental group listened to this music for 20 minutes. The characteristics of *gamelan* music were: no lyrics, a rhythm of 60 to 80 beats per minute, low pitch, slow harmony, and consistent tone color. Music intervention was given twice a day, in the morning (at 10 a.m.) and evening time (at 4 p.m.).

Descriptive statistics were used to describe a subject's characteristics including demographic and clinical characteristics. State anxiety and physiological data were described using mean and standard deviation. Independent t-test for interval scale data and Chi-square test for categorical data were used to compare the differences between groups. Even the data of physiological responses showed a normal distribution, however the assumptions of the population variance was not met. Because, an univariate approach need conform the sperecity of assumptions.[15] As the assumption of homogeneity of variance-covariance matrices (Box's M test, $p \leq 0.05$) was violated, therefore, the separated pairs for time difference were analyzed using paired t-test and a significance level of $p<0.01$ was used to reduce type I errors. After finishing data analysis, the power of this study was moderate effect (0.80).

RESULTS

More than half of the subjects in this study were female (60% in the experimental group and 55% in the control group). The mean age of the subjects in the experimental group was 45.25 years (SD=13.72), and in the control group 47.50 years (SD=13.04). 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-governmental organizations (60%), whereas, 50% of the subjects in the control group were retirees or housewives.

The health status of most subjects was post-operation (40% of the experimental group, 45% of the control group). Subjects in both groups were receiving ventilator support within a range of 1 to 14 days. The mean length of ventilator support in the experimental group and control group were as 4.7 days (SD=1.83) and 5.15 days (SD=2.54) respectively. Bilevel positive airway pressure (BiPAP) was common mode of ventilator support used in the experimental group (50%), and continuous positive airway pressure (CPAP) mode (35%) in the control group. Mostly, the indication of ventilator use in both groups was severe dyspnea (60% of the experimental group; 55% of the control group). There was no statistically significant difference in clinical characteristics between the experimental and control groups (Table 1).

Effects of music intervention on physiological responses at each time point

Independent *t*-test and paired *t*-test 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.

Table 1. Clinical characteristics of experimental and control groups (n=40)

Characteristics	Experimental group (n=20)		Control group (n=20)		χ^2	p
	n	%	n	%		
Health problem					0.54[a]	.54
Cardiovascular disease	3	15	5	25		
Fracture cervical 4	1	5	-	-		
Metabolic disease	2	10	-	-		
Pulmonary disease	3	15	5	25		
Post operation	8	40	9	45		
Renal disease	3	15	1	5		
Mode of ventilator					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/PVC)	-	-	4	20		
Indication of ventilator					10.93[a]	.26
Dyspnea	-	-	-	-		
Severe dyspnea	12	60	11	55		
Respiratory failure	8	40	9	45		
Sleep at night time (hours)					3.52[b]	.19
4 - 3	10	50	14	70		
4 - 6	10	50	6	30		
>6	-	-	-	-		
Length of time on ventilator (days)					0.00[b]	.66
1 - 6	17	85	17	85		
7 - 14	3	15	3	15		
>14	-	-	-	-		
Medication					0.65[a]	.79
None	9	45	7	35		
Analgesic drugs	7	35	7	35		
Cardiovascular drugs	4	20	6	30		

Note. a=Pearson Chi-square, b=Fisher Exact test, BIPAP=Bilevel Positive Airway Pressure, CPAP=Continuous Positive Airway Pressure, SIMV=Synchronized Intermittent Mandatory Ventilation, PS=Pressure Support, PAC=Pressure Assisted Cycle, PVC=Pressure Volume Cycle.

Table 2. 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)

Physiologic responses	T_1 - T_2		T_1 - T_3		*t*	*p*
	M	SD	M	SD		
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

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=0.00). In other words, the systolic blood pressure at T_2 of the experimental group was significantly lower than those of the control group. However, for heart rates, respiratory rates, and diastolic blood pressure, the result demonstrated no significant differences from T_1 to T_2 (p >0.01, Figure 1).

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=0.00). In other words, the systolic blood

pressure at T_3 of the experimental group was significantly lower than those of the control group. Diastolic blood pressure and heart rate at T_3 of the experimental group and the control group were not significantly different (p>0.01). Respiratory rate showed a significant difference at $p \leq 0.01$ (Figure 2).

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<0.01, Table 2, Figure 3).

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>0.01). However, there was a statistically significant difference for respiratory rate (p<0.01, Table 3).

The comparison of mean difference of physiological responses between the experimental group and control group for T2 to T2 (n=40)

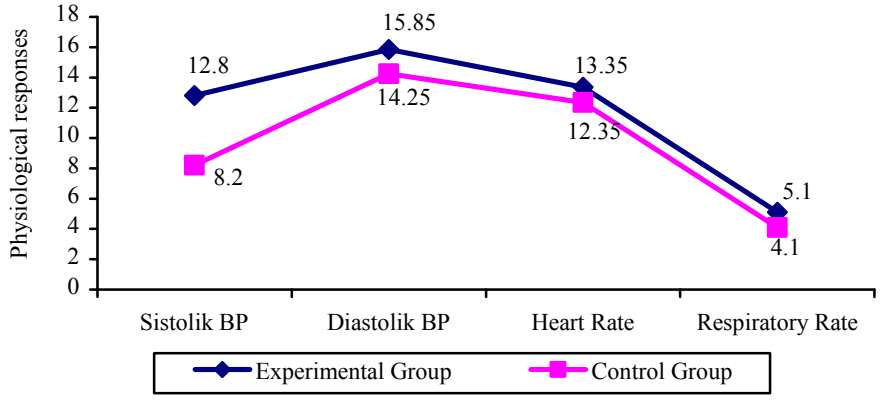

Figure 1. The mean difference of physiologic responses T_1 to T_2

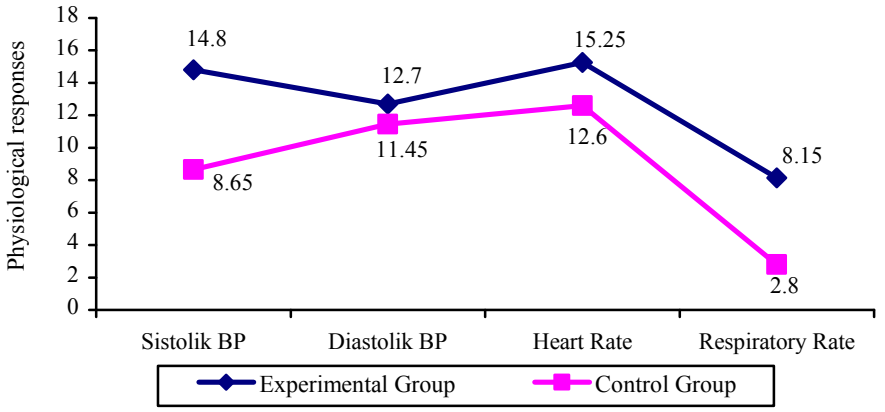

Figure 2. The mean difference of physiologic responses T_1 to T_3

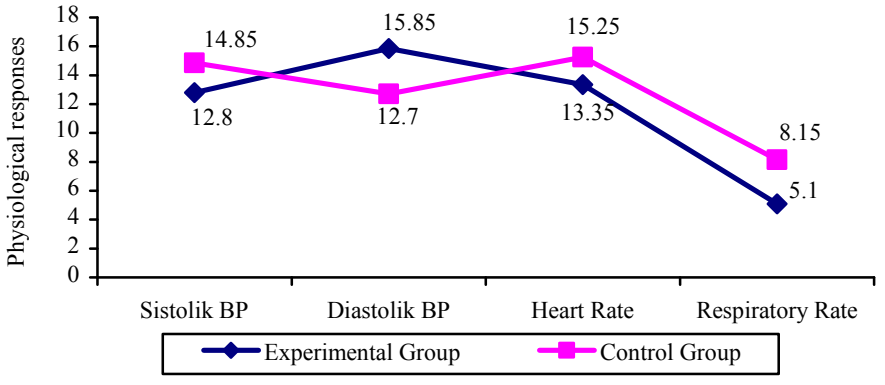

Figure 3. The comparison of mean differences on physiological responses from T_1-T_2 and T_1-T_3 in the experimental group

Table 3. 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)

Variables	T_1 - T_2		T_1 - T_3		*t*	*p*
	M	SD	M	SD		
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

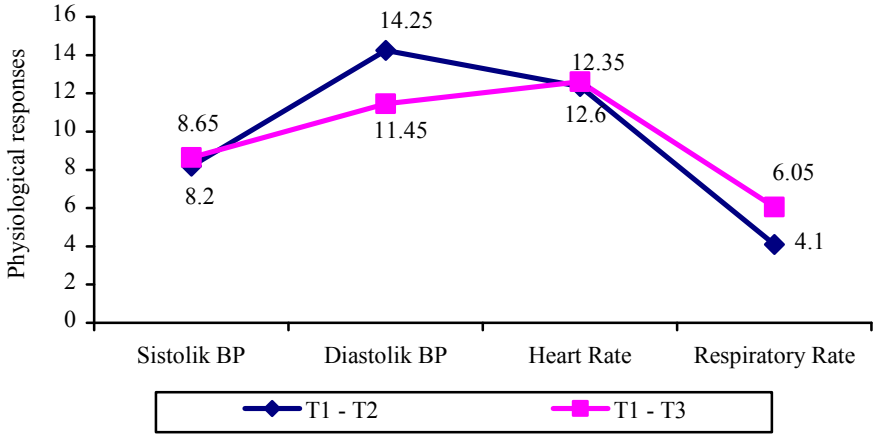

Figure 4. The comparison of mean differences on physiological responses from T_1-T_2 and T_1-T_3 in the experimental group

DISCUSSION

More than half of the subjects in this study were female. 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.

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.[16]

The most common participants' health status was post-operation. The indication of ventilator used in both groups was severe dyspnea. Amitai and Sinert (2009)[17] found that the principal indications for ventilator support were severe dyspnea and respiratory failure.[17] Chlan (2003) studied found 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.[1]

The ventilator mode and number of days used ventilator support might relate to state anxiety level, because the ventilator mode should be match with patients' condition. Ventilator mode settings can produce anxiety and physiological responses because the ventilator mode settings are tailored to the underlying condition.[18] 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.[1]

The duration of sleep at night of the subjects receiving ventilator support was relative inadequate. Such patients have been noted to awaken frequently, have little to no REM (rapid eye movement) sleep, and sleep for shorter periods.[19] Sleep inadequacy will impact physiological readiness for weaning and off ventilator support.[20]

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.[21] Pain is the root cause of distress experienced by many mechanical ventilated patients,[21] 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.[22] There were no significant differences on medication use of both groups, between those who used medication and those who did not.

Music intervention is a noninvasive nursing intervention that can reduce state anxiety among mechanically ventilated subjects in this study. Subjects in the experimental group experienced significant reduction in state anxiety scores compared with subjects in the control group. These results are consistent with previous studies.[2,9] However, special attention ought to be paid to the genre of music. This study used *gamelan* music, a kind of Indonesian ethnic music. This type of music has certain characteristics similar to music used in the previous studies. Brandes (2009) and Byung-Chuel (2008) found that the slow rhythm of 60-80 beats, minimum percussion, and non-lyric are soothing and relaxing and can calm down emotions. *Gamelan* music can reduce patients' anxiety level because it is a familiar music genre for people in Java. Their sense of familiarity stemmed from it being loved music, which further helps them escape to their own world. Utilizing musical elements should be familiar to the patients.[23,24] 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.[25,26]

The mean level of anxiety in the experimental group after receiving music intervention was significantly lower than that compared with the control group. Although both groups indicated reduced post-test anxiety levels, subjects in the experimental group had significantly greater reduction of state anxiety levels compared with subjects in the control group. These results are consistent with previous studies.[2,9] The experimental group mostly fell asleep when the researcher was playing the music, but not so in the control group. It is likely that the music had a hypnotic effect on the patients by reducing attention to the annoying sounds of the surrounding environment.[27] Music can assist patients to sleep.[24] Sleep is a complex, active process that is programmed by the human circadian rhythm. The circadian rhythm is the biological clock based on a day-night cycle, which programs humans to sleep at night and be awake during the day.[28] However, patients on ventilator support usually suffered sleep deprivation, particularly at night time, as shown in the clinical characteristics of this study.

The correlates of sleep in patients on ventilator support between groups could have indicated clinical characteristics such as states of illness and age, and environmental conditions such as noise, light, and disruptions by health care personnel. Anxiety was rated as moderately sleep disturbing by more than 50% of cardiac surgical patients, and 30% of medical and intensive care patients attributed sleep disturbances to their illness.[19] Reducing anxiety and promoting relaxation response may have lead to sleep improvements. Therefore, the anxiety level of the experimental group was lower than that 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.[2,9] 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.[29] 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.[27] 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. 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.[30] Music also can be used to provide the patients with a meaningful, to alleviate boredom, and to allow patients having quiet time.[6]

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 ($p<0.01$) compared with subjects in the control group. In this present study, the 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 $p\leq0.01$. The non significant diastolic blood pressure, which was found in this study, was not consistent with previous study.[9] 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, as mostly the participants were post operation status. 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.[2,9,25,31] Music is such a complex stimulus, and physiologic response is equally complex. It may be necessary to accurately assessed the elements of the music that has the greatest effects on a patient's physiologic responses.

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. 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. 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.[32] When the patients feel relax the blood flowing through all body is smooth.

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).[2,9] 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.[6]

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.

Body rhythms, for instance breathing, heartbeat, and blood flow are in integral part of human, and music can be used to harmonize or bring into sync these internal rhythms. Music exerts its effect through entrainment or synchronization of various body rhythms. The tempo or beat of the music also can be used to synchronous the physiologic responses. Music has potential to entrain hearth rate through the pulse or to entrain breathing through the rhythm.[6]

CONCLUSION

The patients on ventilator support in a critical care unit can be buffered somewhat by the nursing intervention. The involvement of nurses in music intervention can

reduce patient's physiological responses. Several limitations of this study were noted in relation to sample and music. *Gamelan* music was at first applied in performing music intervention, therefore, *gamelan* music needs to be accurately assessed for the elements of the music that have the greatest effects on a patient's physiologic responses.

Despite the findings supporting the hypothesis, the current study needs to be replicated using a larger sample for a longer data collection period to increase the study power. This current study also needs replication in other populations that used the same music genre so as to provide recommendations for music intervention. Music intervention can be used for patients who have sleep deprivation, thus, it is recommended to research the effects of music on sleep quality in mechanically ventilated patients.

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