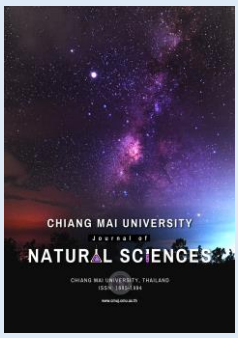

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Corresponding author:
Areewan Klunklin,
E-mail: a.klunklin@gmail.com

Research article

Effects of Lanna Music for Relaxation on Reducing Stress in Adults: A Randomized Controlled Trial

Saranya Wannachaiyakul[1], Areewan Klunklin[2,*], Nantaporn Sansiriphun[3], Jirawan Deeluea[3], Srimana Niyomkar[4], Wipada Kunaviktikul[2], and Prachayaporn Charoenpakdee[5]

1 Department of Psychiatric Nursing, Faculty of Nursing, Chiang Mai University, Chiang Mai 50200, Thailand
2 School of Nursing, Panyapiwat Institute of Management, Nonthaburi 11120, Thailand
3 Department of Obstetrics and Gynecology Nursing, Faculty of Nursing, Chiang Mai University, Chiang Mai 50200, Thailand
4 Department of Pediatric Nursing, Faculty of Nursing, Chiang Mai University, Chiang Mai 50200, Thailand
5 Research Administration, Academic Services, and International Relations Section, Faculty of Nursing, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract Music is an evidence-based, complementary therapy used as a holistic approach for enhancing the quality of life. The music focuses on all levels of consciousness and promotes healing through sound and physical response which can reduce anxiety, resulting in relaxation. This study aimed to investigate the effectiveness of Lanna music for relaxation and reducing stress. A randomized controlled trial enrolled 52 persons with mild to moderate stress and/or depression. Participants were randomly assigned to either the experimental group, who listened to Lanna music for 60 minutes, or the control group, who were instructed to lie down in a comfortable position without the Lanna music. In addition, demographic data, blood pressure, heart rate, respiration rate, alpha brain wave frequency and the responses to the relaxation visual analog rating scale were collected. Descriptive statistics, a repeated measures ANOVA, a paired t-test and an independent t-test were used to test the effects of Lanna music in reducing stress. The analysis showed a significant reduction ($P < .05$) in the mean score of heart rate, respiration rate, and systolic and diastolic blood pressure ($P < .05$) after listening to the traditional Lanna music. Additionally, there was no significant increase in the mean score of the alpha brain wave after 30 minutes. The study results showed that Lanna music for relaxation had an overall significant effect on stress reduction. Listening to Lanna music can reduce heart rate, respiration rate, and blood pressure, especially increasing the alpha brain waves which has the clinical impact of stress reduction and relaxation responses. These findings indicated the positive effect of traditional Lanna music for relaxation and reducing stress.

Keywords: Randomized controlled trial, Lanna music, Stress

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INTRODUCTION

The practice of delivery of holistic healthcare services by nursing professionals focuses on the interconnectivity of the biophysical, psychosocial, and spiritual dimensions of a patient during the healing process. Healing will occur when the biophysical, psychosocial, and spiritual components interact on a balanced level (Dossey and Guzzetta, 2005; Dossey, 2008). The healing benefits of music therapy have been well documented (Kaewvichien and Sangkhamal, 2012; Chen et al, 2019; Tang et al, 2020). The healing power of music has been associated with increased serum levels of endorphin which can reduce anxiety, mental duress and overall perception of pain (Duangbubupha, et al, 2008; Wadyim et al, 2014; Chivaphansri, 2017; van Willenswaard et al, 2017)

The healing power of music extends beyond musical compositions that capture the sounds of nature or classical music, such as Mozart. As early as 2000, Good at al. reported that the choice of music for relief of pain varied by culture (Good et al, 2000). The effectiveness of vocal music therapy in management of chronic pain among African-American residents of inner-city communities in the US underlines the importance of influence of culture on the choice of music as a therapeutic intervention (Bradt, et al., 2016). Lanna music is unique to the Lanna culture, the predominant culture in the northern region of Thailand. The soft and melodic sound of Lanna music is mostly expressed through string instruments (Klunklin, et al., 2013). Despite the therapeutic potentials of Lanna music, its application in the delivery of holistic healthcare services has been limited. We implemented a randomized clinical intervention study to assess the therapeutic effectiveness of Lanna music in reducing mental stress.

MATERIAL AND METHODS

A single-blind randomized controlled trial was used in the study. Each participant was randomly assigned to either the experimental or the control group by the flip of a coin. The experimental group was exposed to Lanna music in a quiet room for 60 minutes, while the control group laid down in a comfortable environment without the music. The physiological response of relaxation, including EEG (alpha brain waves), heart rate (HR), and respiration rate (RR) in both groups, was evaluated at 0, 15, 30, 45 and 60 minutes. Blood pressure and the relaxation assessment were measured before and after the intervention. The study was conducted during June - November 2019.

Subjects

Participants were selected by purposive sampling. Inclusion criteria were adults, aged 25-60 years old who lived in Chiang Mai, Thailand, having mild to moderate levels of stress and/or depression, normal hearing; and the ability to communicate in Thai language. The exclusion criteria were: receiving medication for stress and undergoing other psychotherapy, including music therapy for stress reduction, and participating in other research projects on relaxation or massage therapy. No participants dropped out during this study.

The sample size was calculated using the power of a test, analyzed by using a two-sample independent t-test and the literature reviews from similar studies. The accepted minimum level of significance (α) to estimate the number of the sample size was .05 with the power of .80 (1-β) and the effect size was .80. The calculated sample size was 42 subjects plus the recommended addition of 20% in the case of subjects leaving the study (Polit & Hungler, 1999). Therefore, a total of 52 subjects was selected and randomized into two groups of 26 each, one of being the experimental group, and the other being the control group.

Research Instruments

Instruments for screening the purposive sampling

1 The Suan Prung Stress Test 20 [SPST–20] is a scale for assessing the biological, mental, and social framework. It has a confidence value of .95 (Department of Mental Health, Ministry of Public Health, 2016). The stress levels of subjects were evaluated using the Suan Prung Stress Test [SPST–20], containing 20 self-administered questions. The

SPST-20 score defines four levels of stress: 1) 0-23: mild, 2) 24-41: moderate, 3) 43-62: high, and 4) over 62: severe stress. Only those with a score within the range of 0-41, representing mild to moderate stress levels, were considered eligible to participate in the study. The SPST-20's reliability was tested on a group of 10 adults before its use in this study, and the Cronbach's alpha was 0.82.

2 The 9Q Depression Scale is a 9-item, self-reported rating scale (0-3). It is widely used for screening depressive symptoms at primary care health centers in Thailand. The total scores range from 0 to 27. The Department of Mental Health norms indicate that scores ranging from 0-6 demonstrate no depression; 7-12 represent mild depression; 13-18 indicate moderate depression; and a score ≥ 19 shows severe depression. Only those with a score within the range of 9–18, representing mild to moderate depression, were considered eligible to participate in the study. The 9Q Depression Scale was validated by the Department of Mental Health, Thailand Ministry of Public Health (2007), which developed the scale. The 9Q's internal consistency reliability was indicated with a Cronbach's alpha of 0.82 (Kongsuk, et al., 2010). The reliability of the 9Q Thai Health Department Depression scale was tested before being used in the study, and the Cronbach's alpha was 0.92.

Research instruments

1. A demographic data questionnaire was developed by the researcher and consisted of personal data, including gender, age, education, occupation, salary, medical history, and music preference.

2. A music satisfaction visual analog scale, created by the researcher, ranged from 0 to 10, with 0 meaning "not satisfied" and 10 meaning "the greatest satisfaction".

3. EEG (alpha brain wave), blood pressure, heart rate, and respiration rate measurements were used as objective physiological parameters to investigate for relaxation.

The EEG data was recorded using a Muse EEG headband (InteraXon Inc.) with four electrodes (TP9, TP10, AF7, and AF8) that transmitted brain signals to mobile equipment via Bluetooth. The alpha brain wave frequency was used to determine the users' relaxation.

4. The Lanna music for relaxation was created by a traditional Lanna music expert using the unique characteristics of Lanna music integrated with the art of music therapy. It is 60 minutes long with no lyrics. The validity was verified by three Thai music experts as music for relaxation. The experts listened to the Lanna music to check whether the music met the following criteria: harmonious and peaceful, soft pitched, smooth rhythm and low intensity volume, in order to reduce anxiety and increase relaxation. In addition, the traditional Lanna music expert incorporated the sounds of nature to create well-rounded music for relaxation. The IOC of the three experts was .81 indicated that the Lanna music was an appropriate intervention for relaxation.

Human Subjects

Study approval was received from the Ethical Committee of the Faculty of Nursing, Chiang Mai University (Research ID: 2019-087/ Study Code: 2019FULL035). All participants gave written consent after they received explanations about the purpose of the study, the procedures, and their right to confidentiality and anonymity. They were also informed about their right to withdraw from the study at any time without having to provide a reason. If the subjects needed therapy or counseling during the research, they would be referred to the appropriate resources.

Data Collection

The demographics data for both groups were recorded before beginning the intervention. Subjects who were randomly assigned to the experimental group listened to the Lanna music in a quiet room for 60 minutes, while the subjects in the control group laid down in a comfortable environment without the music. The physiological responses of relaxation, including EEG (alpha brain waves), heart rate (HR), and respiration rate (RR) in both groups, were evaluated at 0, 15, 30, 45 and 60 minutes. Blood pressure and the relaxation assessment were measured before and after the intervention.

Data Analysis

The researchers employed the following statistics for data analysis.

1. Descriptive statistics were used for the demographic data, including frequency, mean, percentage, standard deviation, Chi-square and an independent t-test.

2. The comparison of the alpha brain waves, HR, and RR of the intervention and control groups at 0, 15, 30, 45, and 60 minutes used One-way Repeated-Measures ANOVA.

3. The comparison of the alpha brain wave, HR, and RR between the intervention group and the control group at 0, 15, 30, 45, and 60 minutes used Two-way Repeated-Measures ANOVA

4. The comparison of the mean for blood pressure and relaxation feelings in both groups, before and after the intervention, used the independent t-test.

5. The comparison of the relaxation feelings before and after the intervention in both groups used a paired t-test, and the comparison between the experimental and the control group used an independent t-test.

6. Satisfaction while listening to Lanna music for relaxation was measured by frequency and percentage.

RESULTS

Part 1 The majority of the participants in both the experimental group and control groups were women. The subjects in the experimental group; were 21-58 years old (mean = 44.73; SD = 9.60). Most of them had completed high school (46.20%); had worked (46.20%); have an income of more than 10,000-20,000 baht per month (38.5%); had no chronic illnesses (69.20%); and preferred to listen to country music (30.80%).

The subjects in the control group; were 20-58 years old (mean = 25.96; SD = 10.76). Most of them were studying or had a bachelor's degree (76.90%); have an income of more than 5,000-10,000 baht (50%); had no chronic illnesses (76.90%); and preferred to listen to classical music (42.30%).

Part 2 The comparison of the alpha wave, heart rate, and respiratory rate within the experimental group at 0, 15, 30, 45, and 60 minutes showed a significant decrease in heart rate and respiratory rate ($P < 0.05$) while there were no differences in the alpha wave. On the other hand, the control group showed significantly decreased alpha wave before and after 45 and 60 minutes ($P < 0.05$) but no differences in heart rate or respiratory rate, as shown in Table 1.

Table 1. Comparison of the alpha wave, heart rate, and respiratory rate within the experimental and control group at 0, 15, 30, 45, and 60 minutes.

		mean (SD)								
		minute 0 (1)	minute 15 (2)	minute 30 (3)	minute 45 (4)	minute 60 (5)	1vs2	1vs3	1vs4	1vs5
Experimental group (26)	Alpha brain wave	72.86 (11.53)	71.20 (13.07)	70.68 (10.50)	72.29 (12.02)	75.66 (12.27)	1.00	1.00	1.00	1.00
	Heart rate	77.31 (2.37)	68.19 (1.83)	68.27 (1.91)	67.89 (1.96)	67.81 (2.06)	0.00*	0.00*	0.00 *	0.00 *
	Respirator y rate	20.31 (0.39)	18.08 (0.31)	17.73 (0.35(	17.69 (0.33(	18.23 (0.34)	0.00*	0.00*	0.00 *	0.00 *
Control group (26)	Alpha brain wave	76.86 (7.48)	74.84 (5.97)	73.83 (6.71)	71.50 (7.70)	71.85 (6.89)	1.00	0.22	0.01 *	0.00 *
	Heart rate	77.53 (1.56)	73.46 (1.62)	73.34 (1.63)	72.35 (1.84)	72.81 (1.87)	1.00	1.00	1.00	1.00
	Respirator y rate	19.19 (0.61)	18.69 (0.32)	18.92 (0.28)	19.00 (0.27)	19.00 (0.29)	0.21	0.08	0.10	0.50

Part 3 The comparison of the alpha wave, the heart rate, and the respiratory rate between the experimental and the control groups at 0, 15, 30, 45, and 60 minutes showed no differences (Table 2). However, the alpha wave increased in the experimental group, whereas it was reduced in the control group, as shown in Figure 1. The increased reduction of heart rate and respiratory rate in the experimental group also represents more relaxation due to listening to the music, as shown in Figures 2 and 3.

Table 2. Comparisons of the heart rate, the respiratory rate, and the alpha wave between the experimental and control groups at 0, 15, 30, 45 and 60 minutes.

			SS	df	MS	F	*P*-value
Alpha brain wave	Within subject	Time	295.48	4.00	73.87	2.48	0.04
		Time x group	606.19	4.00	151.54	5.09	0.00*
	Between subject	Group	100.15	1.00	100.15	0.28	0.59
		Error	17,875.71	50.00	357.51		
Heart rate	Within subject	Time	2,003.43	2.92	685.51	17.17	0.00*
		Time x group	237.56	2.92	81.28	2.03	0.11
	Between subject	Group	1,048.01	1.00	1,048.01	3.04	0.08
		Error	17,218.18	50.00	344.36		
Respiratory rate	Within subject	Time	76.56	2.23	34.34	11.11	0.00*
		Time x group	49.56	2.23	22.23	7.19	0.00*
	Between subject	Group	19.93	1.00	19.93	1.97	0.16
		Error	503.80	50.00	10.07		

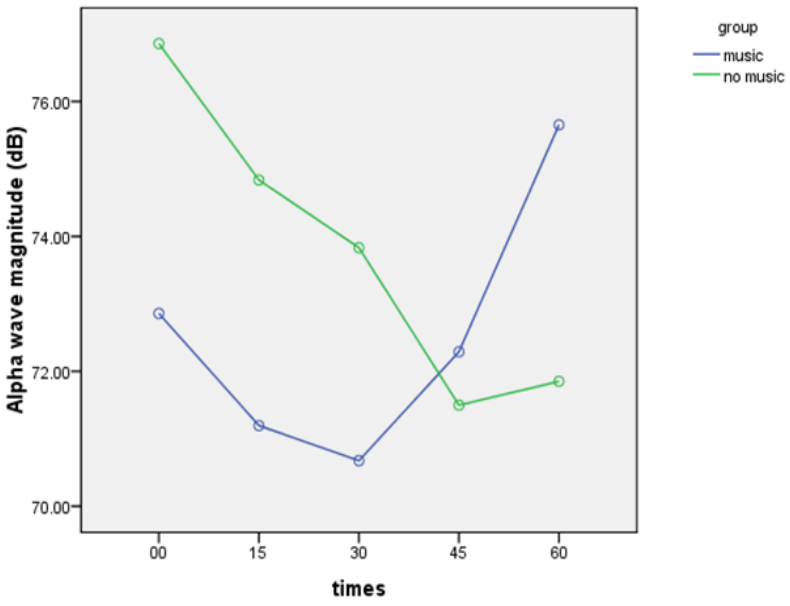

Figure 1. Comparison of alpha brain wave.

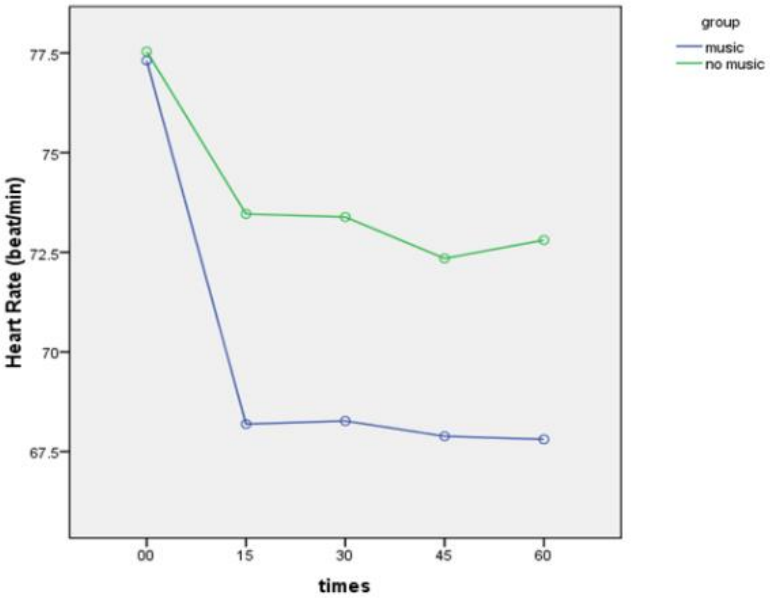

Figure 2. **Comparison of heart rate.**

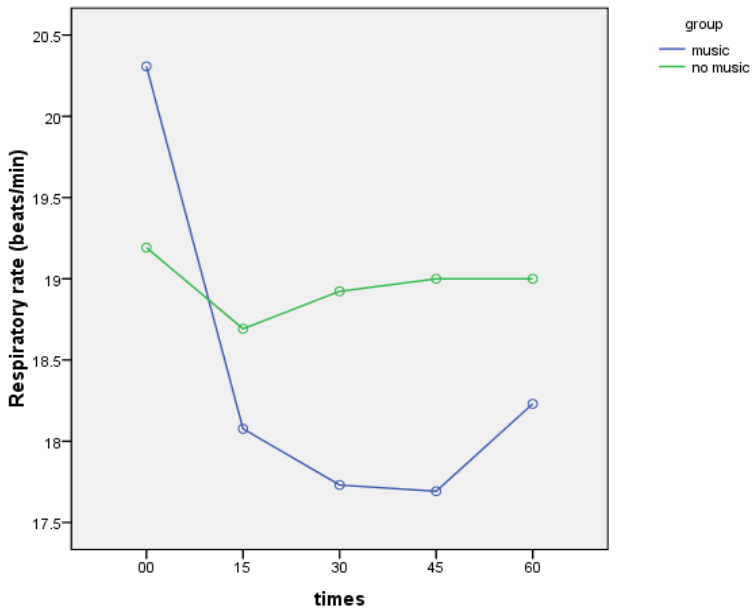

Figure 3. Comparison of respiratory rate.

Part 4 The comparison of the blood pressure within the experimental group before and after the experiment showed a statistically significant ($P < 0.05$) reduction in both systolic and diastolic blood pressure at the end of listening to Lanna music, while no difference was found in the control group as shown in Table 3.

Table 3 Comparison of the mean blood pressure before and after the experiment in both groups.

				95% Confidence Interval of the difference				Sig. (2-tailed)
	Mean	Std. Deviation	nStd. Error Mean	Lower	Upper	t	df	
Experimental group(N=26)								
systolic (pre) - systolic (post)	11.46	11..16	2.19	6.95	15.97	5.23	25.00	0.00*
diastolic (pre) - systolic (post)	5.19	5.35	1.05	3.03	7.35	4.94	25.00	0.00*
Control group(N=26)								
systolic (pre) - systolic (post)	2.11	7.91	1.55	-1.08	5.31	1.36	25.00	0.18
diastolic (pre) - systolic (post)	-3.65	11.56	2.26	-8.32	1.01	-1.61	25.00	0.12

Part 5 The subjects in the experimental group reported significantly more relaxation with the Lanna music ($P < 0.05$) but no difference within the control group. However, there was no difference in the relaxation feelings between the two groups after the experiment, as shown in Tables 4 and 5.

Table 4. Comparison of the relaxation feelings before and after the experiment within the experimental and control group.

				95% Confidence Interval of the difference				Sig. (2-tailed)
	Mean	Std. Deviation	nStd.Error Mean	Lower	Upper	t	df	
Experimental group (N=26)								
Relaxation pre -post	-2.65	2.07	0.40	-3.49	-1.81	-6.51	25.00	0.00*
Control group (N=26)								
Relaxation pre - post	0.00	1.23	0.24	-0.49	0.49	0.00	25.00	1.00

Table 5. Comparison of the relaxation feelings before and after the experiment between the experimental and control groups.

		SS	df	MS	F	*P*-value
Within subject	Time	45.77	1.00	45.77	31.38	0.00*
	Time x group	45.77	1.00	45.77	31.38	0.00*
Between subject	Group Error	4..24	1.00	4.24	0.56	0.45

Part 6 The satisfaction toward the Lanna music was evaluated. All of the subjects in the experimental group rated their satisfaction as "a lot to the most".

DISCUSSION

The Lanna music developed for relaxation was significantly effective for relaxation. The results are in line with the theoretical framework about the body and mind relationship which states that listening to slow and smooth music with a repetitive melody, continuously, can lead to a calm and relaxed body and mind. Music can trigger a variety of chemical reactions in the brain that contribute to relaxation. Previous studies showed that music can reduce anxiety and promote relaxation (Duangbubpha et al., 2008;

Deukhuntodet al., 2016). This research utilized the unique characteristics of Lanna music for relaxation representing the gentle Lanna culture in Northern Thailand. The Lanna music incorporated the art and culture of Lanna with the sounds of nature, for instance, raindrops, birds chirping, and waterfalls. This innovative intervention showed, through the results of this research, that subjects felt relaxed after listening to Lanna music for relaxation, similar to Dokmai's study (2004) in which youths in Bangkok reported that traditional Thai music reduced stress and irritability and also promoted relaxation. In another study done with Thai college students, the results indicated that students listening to traditional Thai music had more relaxation than students who rested comfortably without the music (Puengpensuk, 2016).

This study also measures other indicators of relaxation, including heart rate, respiratory rate, blood pressure, and alpha wave. Music can affect the body and mind through the work of the brain's limbic system. The limbic system and the cortex control emotions and perceptions, and send signals to the hypothalamus. The hypothalamus releases endorphins that relax the muscles and reduce anxiety. In addition, the music stimulates the hypothalamus to release the corticotropin-releasing hormone [CRH]which slows down the sympathetic nervous system resulting in the reduction of the heart rate, the respiratory rate, and blood pressure, as well as the body cells' oxygen use (Trappe, 2012; Tan, et al., 2015).

This research showed the effectiveness of Lanna music for relaxation in significantly reducing the heart rate and respiratory rate ($P < 0.05$). This result is the same as a previous study (Potharom and Sukonthasab, 2011) which also showed a reduction in respiratory rates after 15 minutes of listening to Lanna music until the end of the session ($P < 0.05$), as well as reduction in the systolic pressure, which illustrated the relaxation. The effect of music on reduction of systolic pressure and heart rate has also been documented in previous studies (Guzzetta, 1989; White, 1992; Chlan, 1998; Puang-Ngern, 2001; Chontichachalalauk, et al., 2008; Trappe, 2012; Imoun et al., 2018).

The alpha brain wave is a low frequency wave. The increase in the frequency of the alpha wave indicates relaxation and stress reduction. Although the results of this study showed no statistically significant increase in the alpha wave, the results displayed the continuous increase of the alpha wave at the end of 30 minutes through the end of the session. This outcome revealed the continual relaxation after 30 minutes of listening to the Lanna music until the end. Conversely, the alpha wave decreased in the control group similar to a previous study which showed that listening to music for relaxation increased the alpha wave frequency significantly (Gupta and Gupta 2005; Yang et al., 2007; Morgan et al., 2010).

All of the subjects in the experimental group reported great satisfaction with the Lanna music for relaxation which can be explained by the release of the endorphin, the happy hormone, from the hypothalamus. This endorphin leads to relaxation of both body and mind, and reduces anxiety levels. The Lanna music for relaxation used in this research was developed using the gentle culture of Lanna, the softness and the warmth incorporated with a melody with no lyrics at 60-80 beats per minute because this beat is suitable for humans (Bintasan, 2013). Listening to Lanna music can affect the body and mind which is related to stress reduction, relaxation, and meditation. When individuals feel calm and in harmony, their anxiety decreases, and their health improves.

In this study, all the subjects loved listening to the music, a preference which can be conducive to their relaxation. According to Rumsaeng's study (2004), it was found that college students who loved listening to music or the sounds of nature were able to reduce their stress levels. This was similar to another study in which psychiatric patients who listened to music of their preference felt more at peace, and the mean alpha wave increased (Kwon et al., 2013). This explains the effectiveness of the Lanna music for relaxation.

Implications

According to the results of the study, music can be integrated with nursing practice in various ways. Since the art of music improves our living and safe to integrate into health care settings, there are the widely and worthy use of music for relaxation in clinics, hospitals, home health services, and even school curricula. Music may reduce anxiety and increase the healthiness of patients, family members, or even health care professionals. (Welch et al., 2020; Foster et al., 2021)

In both outpatient and inpatient units in a hospital, Lanna music can be offered as a relaxing alternative to television. This music is not only for patients or family members; it can also be used for nurses, clinicians, staff, and health care personnel. A relaxing break room with Lanna music for relaxation can reduce work-related stress. The feelings of relaxation and satisfaction that they get from such an environment may enable them to improve their work performance and better achieve workplace job expectations. Additionally, home health nurses can offer Lanna music for their patients while performing routine home visits. Listening to music together can change a home visit into a joyful and comforting moment in which both patient and nurse can enjoy routine tasks and responsibilities. Music can be also integrated into courses designed for nursing students or students majoring in health sciences. Introducing music to nursing students establishes a good model for simple, safe, and practical implementing of non-pharmacological nursing interventions. Furthermore, music interventions can be integrated into taught classes about complementary interventions in nursing courses.

CONCLUSION

This study aimed to enhance the process of self-healing through listening to Lanna music for relaxation in adults with anxiety. Music for relaxation should have a slow and regular rhythm of about 60 to 80 beats per minute without any lyrics. Music practice may improve the individual's self-healing by direct action toward the homeostatic stabilization of the autonomic nervous system. Listening to music can affect the body and mind. In addition, the brain wave is slowed down to the alpha wave which is related to stress reduction, relaxation, and meditation. When individuals feel calm and in harmony, their anxiety decreases, and their health improves.

The results revealed that Lanna music had the overall significant effect of reducing stress in adults. This Lanna music for relaxation composed by traditional Lanna music experts was specially designed for comforting and calming. The special soothing characteristics can help individuals recognize the musical elements that contribute to relaxation. This music may be used along with other relaxation techniques for greater therapeutic effect. Moreover, dimming the lights softly and providing quiet surroundings can further enhance the effects of music. As a visual aid, a high-quality television screen showing peaceful scenes, such as beaches, flowers, waterfalls, and natural landscapes will help individuals better enjoy moments of peace.

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AUTHOR CONTRIBUTIONS

Areewan Klunklin planned the research project and approved final manuscript. Saranya Wannachaiyakul, Nantaporn Sansiriphun, Jirawan Deeluea and Srimana Niyomkar designed the model and verified the analytical methods. Nantaporn Sansiriphun, Jirawan Deeluea, Srimana Niyomkar, Wipada Kunaviktikul and Prachayaporn Charoenpakdee obtained data collection. All authors discussed the results, wrote the manuscript. and contributed to the final manuscript.

CONFLICT OF INTEREST

Authors have no potential conflict of interest to report.

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