Effects of Music Intervention on State Anxiety and Physiological Indices in Patients Undergoing Mechanical Ventilation in the Intensive Care Unit: A Randomized Controlled Trial

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Abstract

Patients in intensive care units (ICUs) often experience stress and anxiety. Although stress and anxiety can be pharmacologically attenuated, some drugs cause adverse side effects such as bradycardia, immobility, and delirium. There is thus a need for an alternative treatment with no substantial adverse effects. Music intervention is a potential alternative. In the present study, we used cortisol levels, subjective questionnaires, and physiological parameters to explore the anxiety-reducing effects of music intervention in a sample of ICU patients on mechanical ventilation. Patients admitted to the ICU for ≥24 hr were randomly assigned to the music intervention (n = 41) or control group (n = 44). Music group patients individually listened to music from 4:00 to 4:30 p.m.; control group patients wore headphones but heard no music for the same 30 min. Anxiety was measured using serum cortisol levels, the Chinese Version of the State-Trait Anxiety Inventory, the Visual Analogue Scale for Anxiety, heart rate, and blood pressure. After adjusting for demographics, analysis of covariance showed that the music group had significantly better scores for all posttest measures (p < .02) and pre–post differences (p < .03) except for diastolic blood pressure. Because of music intervention’s low cost and easy administration, clinical nurses may want to use music to reduce stress and anxiety for ICU patients. A single 30-min session might work immediately without any adverse effects. However, the duration of the effect is unclear; thus, each patient’s mood should be monitored after the music intervention.

Keywords

anxiety, cortisol, intensive care unit, music intervention, ventilation, vital signs

Critically ill patients in intensive care units (ICUs) often require sophisticated mechanical ventilation. These patients often experience an increase in stress levels because they are not able to breathe independently and might not be able to communicate effectively or rest normally (Wong, Lopez-Nahas, & Molassiotis, 2001). In addition, many studies have shown that treatments accompanied by mechanical ventilation in the ICU might induce physical and psychological stress that cause anxiety for patients (Bergbom-Engberg & Haljamae, 1989; Hall-Lord, Larsson, & Steen, 1998; Thomas, 2003). Therefore, treating the anxiety of ICU patients, especially those undergoing mechanical ventilation, is a critical issue for clinical nurses. Although sedatives, opioids, and neuromuscular blocking agents can help these patients deal with their anxiety (Rowe & Fletcher, 2008), these drugs have serious adverse effects such as bradycardia, hypotension, dysmotility, immobility, weakness, and delirium (Arroliga et al., 2008; Mehta et al., 2006). Thus, clinical nurses—especially those providing care in an ICU—need to find alternative methods for management of patient anxiety.
Studies have reported that music intervention may reduce stress, pain, and anxiety for patients in an ICU (Nilsson, 2008; Pelletier, 2004) and may have the potential to replace drugs for reducing anxiety. In addition to low cost, reasons for replacing pharmacological intervention with music intervention include the following: (1) Music can distract patients from awareness of the stimuli that cause stress responses (McCaffery & Beebe, 1989). (2) Music can entrain various body rhythms, such as breathing, heart rate, and blood flow. Specifically, music with a slow and flowing rhythm of 60–80 beats per minute duplicates a person’s pulse rate and decreases sympathetic nervous system activity (Chlan, 2000); heart rate, respiratory rate, and blood pressure tend to decrease, which indicates a relaxation response (O. K. A. Lee, Chung, Chan, & Chan, 2005). (3) The aesthetic pleasure people experience listening to music affects the limbic system and induces the pituitary gland to release endorphins, which produce analgesia and a sense of well-being (White, 1992). (4) Relaxing music helps improve sleep quality by reducing interference from potentially noxious environmental stimuli and by relieving anxiety (Hu, Jiang, Hegadoren, & Zhang, 2015).

Health-care providers can use music as a clinical or self-management technique to help patients mitigate their pain, anxiety, and stress (Chlan et al., 2013; Henry, 1995; Nilsson, 2008). Of the dozens of randomized controlled trials (RCTs) exploring the effects of music intervention in ICU patients in the past 18 years, three have reported that after a single 30-min session, scores on the Chinese version of the State-Trait Anxiety Inventory (C-STAI) were significantly lower in patients undergoing mechanical ventilation in the music intervention groups but not in those in the control groups treated only with rest (Chlan, 1998; Han et al., 2010; Wong et al., 2001). However, other RCTs found no significant attenuation of subjective anxiety levels among ICU patients treated with music intervention (Cooke et al., 2010; O. K. A. Lee et al., 2005). Because self-reported anxiety levels might be biased if respondents do not understand the questionnaire (Adams, Soumerai, Lomas, & Ross-Degnan, 1999), studies that rely on these measures of anxiety might not find therapeutic effects or might measure them incorrectly. Thus, a number of researchers have used the proxy measure of physiological parameters to detect and confirm the effects of music intervention on anxiety for patients in the ICU. The authors of one meta-analysis concluded that patients in diverse clinical settings had significant decreases in blood pressure and heart rate after undergoing music intervention, while patients in the control groups, who underwent no music intervention, had no such significant decreases (Loomba, Arora, Shah, Chandrasekar, & Molnar, 2012).

Although the effects of music intervention on anxiety in ICU patients may seem obvious based on previous research results, there is a need for more and stronger evidence than measures of blood pressure and heart rate to support its clinical application because those measures reflect not only psychological stress and anxiety but also environmental conditions such as high temperature or the positive excitement caused by anticipating or enjoying pleasurable activities. We suggest that use of a measure for anxiety that is directly linked to psychological stress will provide more useful results. The stress biomarker cortisol, a reliable indicator of the hypothalamus–pituitary–adrenal axis (HPAA) adaptation to stress, would be ideal (Hellhammer, Wust, & Kudielka, 2009). In addition, we noted a methodology issue in previous studies that could partially explain the divergent results among the studies (Chlan, 1998; Cooke et al., 2010; Han et al., 2010; O. K. A. Lee et al., 2005; Wong et al., 2001). Specifically, investigators tested the effects of the intervention without controlling for demographic characteristics and baseline measures. Although RCTs have the ability to minimize the impacts of this issue, they cannot completely eliminate them. If the impacts of demographics and baseline measures are minimized, the effects of the given intervention will have more chance to demonstrate significance. We suggest that using statistical methods that adjust for confounders would lead to more robust results for studies examining the effects of music intervention among patients.

In the present study, therefore, we conducted an RCT using both physiological (cortisol levels) and self-report measures (C-STAI) of anxiety as well as robust statistical methods to investigate the effects of music intervention among patients undergoing mechanical ventilation in the ICU. Based on the previous findings, we hypothesized that anxiety would decrease after a patient had been treated with a single 30-min session of music intervention.

**Materials and Method**

**Ethics, Consent, and Permissions**

The institutional review board, Human Research Ethics Committee of the Chung Shan Medical University Hospital (IRB: CSH-2013-A-018) provided ethical approval before the study began. Our protocol included a provision for withdrawing participants whose health deteriorated during the study. All participants in this study provided written informed consents.

**Instrumentation for End Points**

**Primary end point: Anxiety levels.** We measured anxiety using objective and subjective methods. The objective measure was serum cortisol levels. Researchers frequently use HPAA-produced cortisol as a biomarker of psychological stress, with a higher serum cortisol level indicating a higher level of anxiety (Hellhammer et al., 2009). We assayed serum cortisol using an automatic gamma counter (2470 Wizard2; PerkinElmer, Turku, Finland). The intra-assay coefficient of variation was <8%, and the detector efficiency was >98%. Although serum cortisol is not specific to anxiety, combining this measure with subjective measures of anxiety and our secondary end points of blood pressure and heart rate should bolster the usefulness of the cortisol to measure anxiety.

As subjective measures of anxiety, we used the Visual Analogue Scale for Anxiety (VAS-A) and the Chinese version of the C-STAI. On the VAS-A, respondents rate their current anxiety level along a 100-mm scale, with a score of 100 on the right side indicating the highest level of anxiety and the score of 0 on the left side indicating the lowest level of anxiety. The
C-STAI includes two constructs, one that measures state and one that measures trait anxiety. We used 20 state-anxiety items in this study because state anxiety was our focus. Participants rated each item on a 4-point Likert-type scale, with a lower rating representing a lower level of anxiety. The state construct of the C-STAI has adequate reliability (α = .90), test–retest validity (r = .74), and concurrent validity (Chung & Long, 1984; Shek, 1993). In the current study, Cronbach’s α for the C-STAI was .83 for the baseline measures and .79 for posttest.

Secondary end points: Blood pressure and heart rate. Blood pressure and heart rate were automatically monitored and recorded (HP/Philips/Agilent M1205A). The system was calibrated twice per year.

**Participants, Procedures, and Sample Size**

We recruited participants from an academic medical center with 1,105 beds in Taichung City, Taiwan. The medical and surgical ICU in the academic medical center has 47 beds, 9 of which are in private isolation rooms, which is where we conducted the study (for both music intervention and control groups). All the participants and the research nurses were blinded to the randomized group assignment.

The inclusion criteria were (1) age of 18–85 years; (2) voluntary participation and understanding of the study purpose; (3) ability to understand and communicate in Mandarin Chinese, Taiwanese (Southern Min), or both; (4) consciousness and mental clarity; (5) ability to communicate using body gestures, writing, or both; and (6) admission to the ICU for ≥ 24 hr (C. H. Lee, Chang, Wang, Lai, & Lai, 2015; Wong et al., 2001). The exclusion criteria were (1) impaired hearing, (2) a skull injury that restricted the use of headphones, (3) the use of physical restraints, (4) alcoholism, (5) infectious disease, (6) hemodynamic instability, (7) treatment with continuous intravenous analgesic or sedative, or (8) treatment with cortisol drug (C. H. Lee et al., 2015; Wong et al., 2001). We used G*Power 3.1.5 (Faul, Erdfelder, Lang, & Buchner, 2007) to estimate the sample size using the following setups: an effect size of Cohen’s d = 0.8 on a two-tailed independent t-test, a type I error of .05, an allocation ratio of 1 for the two groups, and a power of .8. We used an effect size of .8 because Han et al. (2010) reported a large difference in C-STAI score between their music intervention and control groups (their Cohen’s d was circa [ca.] 1.67), and O. K. A. Lee, Chung, Chan, and Chan (2005) reported a small difference in C-STAI score as indicated by a small effect size (their Cohen’s d was ca. 0.04) between the two groups. Thus, using an effect size between the two seemed appropriate. The resulting calculated sample size for each group was 26, for a total of 52. Because we were concerned about potentially low acceptance and high dropout rates based on a 50% response rate in a previous study in Taiwan (Su, Wang, & Lin, 2013), we doubled the calculated sample size, inviting 108 patients to participate. Of the initial 108 patients, we retained 85 to study completion, resulting in an acceptable sample size.

**Figure 1. Flow diagram of the study.** C-STAI = Chinese Version of the State-Trait Anxiety Inventory; HR = heart rate; VAS-A = Visual Analogue Scale—Anxiety.

Head nurses in the ICU identified eligible patients in the ICU, explained the study purpose, asked for a signed informed consent, and then determined each patient’s preferred kind of music for intervention (further described below). As described above, we invited 108 eligible patients to participate (Figure 1 presents a flow diagram of the study). After determining patients’ eligibility, a research nurse used the rand between function in the Excel to decide whether each participant would be assigned to the music (random number = 2) or control group (random number = 1). Of the initial 108 patients invited, 10 patients or their caregivers declined to participate and 13 dropped out because of unexpected yet necessary intervention during the study. Finally, 85 patients provided signed informed consent.

The primary end point was anxiety measured as serum cortisol levels (objective indicator) and as C-STAI and VAS-A scores (subjective indicators). Secondary end points were heart rate and blood pressure. We collected baseline data at 4:00 p.m., minutes before the start of the intervention, and posttest data at 4:30 p.m. right after the intervention. At each time point, one trained research nurse who was blinded to the research aim administered the C-STAI and VAS-A, while another took a blood sample and recorded the heart rate and blood pressure, which were continuously monitored from 4:00 to 4:30 p.m., according to standardized procedures. The study ran from August 2013 through December 2014.

**Interventions**

**Music intervention.** Between 4:00 and 4:30 p.m., when the patients were not receiving other treatments for their illnesses,
we provided a 30-min music-listening session for each participant in the music group. Each participant selected one of the following music programs according to her or his preference: Western classical music (e.g., Erik Satie’s *Trios Gymnopédies*, Mozart’s *Piano Concerto no. 26*), Chinese classical music (e.g., bamboo flute, rain, and tears), music of natural sounds (e.g., Sylvan Spa, www.mymusic.net.tw/singer/show/10334; Relax Your Mood, http://8tracks.com/explore/nature_sounds), or religious music (Buddhist, https://www.youtube.com/watch?v=Qy0S-mVjwOE, or Christian, https://www.youtube.com/watch?v=dfpOvM5OcuY; Chan, Chung, Chung, & Lee, 2008; O. K. A. Lee et al., 2005).

All of the music had a slow beat (60–80 beats per minute) that corresponds to a normal heart rate and was relaxing for the patients (Ko & Lin, 2012; Korhan, Khorsheid, & Uyar, 2011). Patients listened to the music through headphones attached to an MP3 player placed bedside. Participants were free to ask the research nurse to help them adjust the volume. All participants lay on their beds with the lights low and the room temperature set at 26°C when they listened to the music. A research nurse silently sat at the bedside to care for the participants’ physical needs when necessary. No other interventions or instructions were given during the period, and a cautionary note reading, “Do not disturb during the period of music intervention,” was pasted outside the room.

**Control intervention.** Each participant in the control group had a 30-min rest between 4:00 and 4:30 p.m., when patients in the intervention group were listening to music. Control participants also wore headphones and had a research nurse silently sitting bedside to care for their physical needs when necessary. The control group thus did not receive usual care but rather an attenuated noise intervention, and the head-phones without music may have served as a stressor. As a result, the nurses sitting at the bedside to care for their physical needs when necessary. No other interventions or instructions were given during this period. Prior to the intervention, no participants in either group had met the research nurse who sat at the bedside.

**Data Analysis**

We used SPSS 17.0 for Windows for all analyses, calculating descriptive statistics for all demographic and clinical characteristics and study measures. In addition, we used χ² tests to examine the differences in categorical variables between the two groups. To adjust for the effects of demographic characteristics, we used two sets of analysis of covariance (ANCOVA): The first set tested group effects on posttest measures while adjusting for age, gender, educational level, marital status, religious belief, experience of ventilator, type of airway, and ventilator mode. The second set tested group effects on the differences between pre- and posttest measures with the same adjustments as the first set plus the baseline measures.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Music (n = 41)</th>
<th>Control (n = 44)</th>
<th>χ² or t²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (SD)</td>
<td>59.46 (9.87)</td>
<td>59.52 (8.37)</td>
<td>0.03</td>
<td>.98</td>
</tr>
<tr>
<td>Gender, female</td>
<td>19 (46.3)</td>
<td>29 (65.9)</td>
<td>3.31</td>
<td>.07</td>
</tr>
<tr>
<td>Highest level of education</td>
<td></td>
<td></td>
<td>1.23</td>
<td>.54</td>
</tr>
<tr>
<td>completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ Junior high school</td>
<td>15 (36.6)</td>
<td>16 (36.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior high school</td>
<td>8 (19.5)</td>
<td>5 (11.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ College</td>
<td>18 (43.9)</td>
<td>23 (52.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td>0.20</td>
<td>.65</td>
</tr>
<tr>
<td>Married</td>
<td>28 (68.3)</td>
<td>32 (72.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>13 (31.7)</td>
<td>12 (27.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
<td>0.09</td>
<td>.77</td>
</tr>
<tr>
<td>Yes</td>
<td>22 (53.7)</td>
<td>25 (56.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19 (46.3)</td>
<td>19 (43.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior experience with ventilator</td>
<td></td>
<td></td>
<td>0.17</td>
<td>.68</td>
</tr>
<tr>
<td>no</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of airway</td>
<td></td>
<td></td>
<td>0.02</td>
<td>.89</td>
</tr>
<tr>
<td>Oral endotracheal tube</td>
<td>34 (82.9)</td>
<td>36 (81.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracheotomy tube</td>
<td>7 (17.1)</td>
<td>8 (18.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilator mode</td>
<td></td>
<td></td>
<td>0.04</td>
<td>.98</td>
</tr>
<tr>
<td>PACV</td>
<td>20 (48.8)</td>
<td>21 (47.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS</td>
<td>15 (36.6)</td>
<td>17 (38.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC</td>
<td>6 (14.6)</td>
<td>6 (13.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days on ventilator, mean (SD)</td>
<td>2.66 (1.24)</td>
<td>2.43 (1.21)</td>
<td>0.85</td>
<td>.40</td>
</tr>
<tr>
<td>Type of music selected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western classical</td>
<td>9 (22.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese classical</td>
<td>14 (34.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music of natural sounds</td>
<td>7 (17.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious music</td>
<td>11 (26.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 85. Data are reported as n (%) unless otherwise indicated. AC = assist control mode; PACV = pressure assist control ventilation; PS = pressure support.

*Data reported as n (%) were tested using χ², while those reported as mean (SD) were tested using t-test.

**Results**

**Demographic and Clinical Characteristics of Participants**

None of the 85 participants who completed the study was in a deteriorated condition. Therefore, the nurses sitting at the bedside only observed them and did not provide any care service. The mean (SD) ages were 59.46 (9.87) years in the music group and 59.52 (8.37) years in the control group (t = .03; p = .98). There were no significant differences in the demographic or clinical characteristics between the two groups. More than half of the participants were women (n = 48), had an educational level ≤ senior high (n = 44), were married (n = 60), and had a religion (n = 47). Patients had spent 1–6 days on mechanical ventilation. Reasons for mechanical ventilation included anesthesia use due to the demands of surgery, pneumonia, asthma, chronic obstructive pulmonary disease, and heart failure. Most participants in the music group selected Chinese classical music followed by religious music, Western classical music, and music of natural sounds (Table 1).
Effects of Music Therapy on Patients’ Anxiety Levels

Before we conducted the ANCOVA to detect differences between the groups in our end point variables, we examined the distributions of our primary and secondary end points. Except for the posttest measure of serum cortisol in the control group, which had a slightly high kurtosis value (3.48), all the skewness and kurtosis values were between −3 and 3 (Table 2). Therefore, our data were appropriate for the parametric statistics of ANCOVA.

The ANCOVAs showed that the music group had significantly better values for all posttest measures and for pre–post differences compared to the control group (\(p = .02\) to <.001 and \(p = .03\) to <.001, respectively) except for diastolic blood pressure (\(p = .44\) and \(p = .43\), respectively) after we had adjusted for demographic characteristics (Table 3).

Discussion

The present study was the first to use cortisol, a commonly used biomarker of stress, to examine the effects of music intervention on the anxiety level of patients undergoing mechanical ventilation in an ICU. We also used additional anxiety-related measures—commonly used subjective measurements and physiological indicators—as supporting evidence that music intervention mitigates anxiety. All of our outcomes showed that a single 30-min session of music reduced anxiety for patients undergoing mechanical ventilation in an ICU.
Our promising results regarding the ability of music intervention to reduce anxiety agree with the findings of Chlan (1998) and Han et al. (2010) showing that music intervention reduced anxiety as measured by self-reported C-STAI scores and with those of O. K. A. Lee et al. (2005) and Wong, Lopez-Nahas, and Molassiotis (2001) showing that it reduced anxiety as measured by the physiological indicators of blood pressure, heart rate, and respiratory rate. However, our findings regarding the intervention effects on our participants’ C-STAI and VAS-A scores contradict those of Cooke et al. (2010) and O. K. A. Lee et al. (2005) from RCT studies in which they measured anxiety using the C-STAI and Faces Anxiety Scale. The music intervention in Cooke et al. (2010) was only 15 min long and did not significantly reduce participants’ scores on these scales, while in the present study and two others (Chlan, 1998; Han et al., 2010), the music interventions were 30 min long and effective in reducing participant scores on these measures. We therefore conclude that one 15-min session is insufficient to elicit a detectable effect. However, future studies are needed to more precisely determine the optimal duration for a music intervention. O. K. A. Lee et al. (2005) found that C-STAI scores were not significantly different after a 30-min music intervention. One possible explanation for the differences in findings between the present study and those with which our findings agree and Lee et al.’s is that the latter’s study sample (mean age of 69.4 ± 15.2 years; 28.1% female) was older and had fewer females than did ours (mean age of 59.49 ± 9.07 years; 56.5% female), Chlan’s (1998; mean age of 57.1 years; 59% female), and Han et al.’s (2010; mean age of 46.18 ± 15.59 years; 56.2% female). As Nilsson (2008) and Pelletier (2004) have reported, age and gender both impact self-rated anxiety.

Measuring each patient’s serum cortisol levels before and after the intervention reinforced existing evidence that music intervention reduces anxiety because cortisol level is a more accurate indicator of anxiety than self-reported measures and the three standard physiological indicators of blood pressure, heart rate, and respiration rate. Although the posttest measures of serum cortisol did not differ significantly between the music and control groups, there were marginally significant differences between the groups in pre–post measures. In addition, serum cortisol levels were significantly decreased from baseline to posttest in the music group but nonsignificantly increased in the control group after we adjusted for demographic characteristics. Therefore, we conclude that the music intervention reduced anxiety in these patients.

Limitations
The present study had some limitations. First, the musical choices were restricted to four categories, and our participants might not have been able to choose their favorite type of music for the intervention. Thus, the effects of the music intervention might have been diminished. However, because our results showed positive effects, we conclude that the limited musical choices did not substantially affect our results. Future studies might also want to explore how many musical choices are sufficient and whether the effects of an intervention derived from using music that participants enjoy are more positive than those derived from using music that they do not like. Second, we did not examine any long-term effects of our single 30-min music intervention. Therefore, we cannot determine the duration of the anxiety-reducing effects. We suggest that future studies investigate the long-term effects of a single 30-min music intervention. In addition, studies comparing the effects of music interventions with different frequencies (e.g., once or twice per day) and various lengths (e.g., 30-min or 60-min sessions) are warranted. Third, because we recruited all of the participants from the same hospital, their demographic characteristics might be somewhat similar and might not reflect the characteristics of the broader population. Hence, the generalizability of our results might be restricted. Fourth, although we are confident that our cortisol results reflect the anxiety levels of our participants, researchers are cautioned to take into account the circadian changes in cortisol level (Kirschbaum et al., 1990). Because of this quality of cortisol, our results represent not an absolute comparison, but a relative comparison of anxiety levels between the two groups. Fifth, our findings may not be transferable to mechanically ventilated patients with altered levels of consciousness. Sixth, our procedure of having a research nurse seated bedside during both the control and music interventions may have reduced the anxiety level in our participants. Finally, wearing headphones that transmitted no sound may have caused anxiety for patients in the control group.

Conclusion
Based on our findings in the present study and those of previous research, we recommend that clinical nurses use music to help reduce ICU patients’ anxiety levels. A single 30-min session spent listening to music might immediately decrease patients’ anxiety without any adverse effects. In addition, music intervention is inexpensive and easily administered. However, because the duration of the effect is unclear, clinical nurses should continue to monitor patients’ mood after providing the music intervention. Also, nurses must be aware that patients may have diverse responses to music; therefore, nurses might consider asking patients about their music preferences during patient evaluation.

Author Contributions
Chiu-Hsiang Lee contributed to conception, design, and interpretation; drafted and critically revised the manuscript; gave final approval; and agrees to be accountable for all aspects of work ensuring integrity and accuracy. Chien-Ying Lee contributed to acquisition and interpretation, critically revised the manuscript, gave final approval, and agrees to be accountable for all aspects of work ensuring integrity and accuracy. Ming-Yi Hsu contributed to interpretation, critically revised the manuscript, gave final approval, and agrees to be accountable for all aspects of work ensuring integrity and accuracy. Chiung-Ling Lai contributed to acquisition, critically revised the manuscript, gave final approval, and agrees to be accountable for all aspects of work ensuring.
integrity and accuracy. Yi-Hui Sung contributed to acquisition, critically revised the manuscript, gave final approval, and agrees to be accountable for all aspects of work ensuring integrity and accuracy. Chung-Ying Lin contributed to design and analysis, drafted and critically revised the manuscript, gave final approval, and agrees to be accountable for all aspects of work ensuring integrity and accuracy. Long-Yau Lin contributed to conception, design, acquisition, analysis, and interpretation; critically revised the manuscript; gave final approval; and agrees to be accountable for all aspects of work ensuring integrity and accuracy.

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