

ARTICLE

## The Role of Music to Promote Relaxation in Intensive Care Unit Patients

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### ABSTRACT

**BACKGROUND:** The intensive care unit (ICU) is one of the most stressful environments for patients among various clinical settings in a hospital. ICU patients are not only compromised by illness but also faced with a wide range of stressors. Most of the time, pharmacological therapies are commonly used to control the distress, but are expensive and lead to high hospital care costs. It is thought that music can act as a nursing intervention to relieve both physiological and psychological responses and increase comfort of patients.

**OBJECTIVE:** The aim of the study was to identify, review and evaluate the literature regarding the role of music listening to promote relaxation for patients in the ICU together with considerations for future research.

**METHODS:** MEDLINE, PubMed, CINAHL, AMED and PsycINFO databases were searched for the terms “music therapy”, “music medicine” and “music listening”. In addition, an internet search using Google Scholar was performed.

**RESULTS:** Literature research shows that music can influence a wide range of physiological and psychological effects and is effective in decreasing stress and facilitating relaxation responses. Different types of music and music preference of the individual patient may have a different effect. Moreover, live music is considered more important than pre-recorded music.

**CONCLUSION:** Music therapy has been widely used in a variety of cultures for centuries to decrease patients’ perception of pain, anxiety and depression, and boost their feelings of relaxation. Music can be used as a safe and inexpensive non-pharmacologic antianxiety intervention to enhance relaxation and decrease stress in ICU patients. The key implication is to educate doctors and nurses on modern aspects of music therapy.

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**KEY WORDS:** *music therapy; music medicine; music listening; relaxation; patients; intensive care unit*

#### ABBREVIATIONS

ICU = intensive care unit

HR = heart rate

RR = respiratory rate

BP = blood pressure

ACTH = adrenal corticotropin hormone

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### INTRODUCTION

The intensive care unit (ICU) is one of the most stressful environments for patients among various clinical settings in a hospital. ICU patients are not only compromised by illness but also faced with a wide range of stressors, such as experience of pain, unfamiliar environment, insomnia, fear, threat of death and loss of interaction with family and friends. Increased stress activates the sympathetic nervous system, as manifested

by an increased heart rate (HR), blood pressure (BP) and respiratory rate (RR), possibly leading to a destructive anxiety syndrome. Most of the time, pharmacological therapies are commonly used to control the distress, but are expensive and lead to high hospital care costs.<sup>1</sup> Thus, non-pharmacological therapy should be attempted to reduce such costs as well as to promote the comfort of patients.

Critically ill patients commonly experience anxiety, pain and discomfort as part of their ICU stay.<sup>2,3</sup> These experiences can be a result of their illness or from the care health professionals provide. Furthermore, being subject to numerous procedures common in the ICU setting such as turning, endotracheal suctioning and wound care can also adversely affect patients.<sup>2</sup> Discomfort and anxiety have the potential to lengthen ventilator weaning time and ultimately lengthen ICU stay. The pain associated with these procedures can result in a number of negative stress sequelae for patients that can be detrimental to their health and well-being.<sup>4,7</sup>

Music therapy has been widely used in a variety of cultures for centuries to decrease patients' perception of pain, anxiety and depression, and boost their feelings of relaxation. It is thought that music therapy can act as a nursing intervention to relieve both physiological and psychological responses and increase comfort of patients.<sup>8</sup>

The positive effects of music expressed as a source of comfort and an outlet for emotional expression have been exploited therapeutically.<sup>9-11</sup> These effects of music have been used as a tool to bring about positive changes in the behavior and emotional well-being of individuals, thus coining the term "music therapy". Recognized as a "universal language", music therapy is successfully used in reducing feelings of stress and isolation<sup>9</sup>, management of physical symptoms such as increasing the distraction from pain, and is instrumental in the management of emotional and behavioural afflictions.<sup>10-12</sup>

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#### A TOUCH OF HISTORY

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The use of music in relation to illness and health has been known since ancient history. Pythagoras by dividing the monochord into simple ratios connected music, mathematics and medicine.<sup>13</sup> Somatometry in nature follows mathematics of music and Pythagorean theories. Plato was the first authorized music medicine prescriber in the history of medicine and he suggested that we need musical rhythm to overcome our tension as humans and move into a diseased and non-ordered status. He prescribed the Dorian musical mode as ideal medicine for body and soul. Aristotle suggested clearly in his work that we can use music to alter various mood conditions and suggested Mixolydian, Dorian and Phrygian mode for different mood states. Hippocrates applied also music medicine.<sup>13</sup> Shamans and medicine men of indigenous people have used music, drumming, singing, and dancing to heal people.<sup>14</sup>

In the 19<sup>th</sup> century, music was considered for healing purposes as addressed by Nightingale's concerns regarding the effect of noise and music in the care of patients. What may harm the sick person "is the unnecessary noise and the noise that causes specific expectations" and that harsh or sudden sounds are more harmful than a steady noise level.<sup>15</sup> These comments may still be relevant in today's hospital environment which is characterized by a highly technologically developed milieu with sounds from monitoring systems, alarms, telephones, and high level nursing activity. Nightingale at her time found music to be a neglected area as it was considered too expensive to implement into nursing. She probably was considering live music only, as recording music at that time was not an option. Further, she comments on the effects of specific instruments; wind instruments, including the human voice, and string instruments, that are characterized by prolonged tones, would have a pleasant effect, whereas the opposite would be true for piano and other instruments with short lasting tones.<sup>15</sup>

In the late 19<sup>th</sup> century the first recorded music was used in the hospitals as an intervention to diminish anxieties associated with surgery and it has been a growing field of development and research since after World War II, especially in the USA and in Germany.<sup>16</sup> Music therapy has risen to the challenge of research in recent years. Not only is there a tradition of quantitative research but qualitative research approaches have been also incorporated within the discipline as is necessary for a clinical approach that involves science and art.

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#### THE USE OF MUSIC IN MEDICAL SETTINGS

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Two different complementary approaches to the use of music in medical settings are distinguished and reported to be currently in practice, music medicine and music therapy.<sup>17</sup> *Music medicine* is used as an adjunct to the medical treatments by medical professionals, typically nurses and doctors, and interventions are based on the use of selected, pre-recorded music. *Music therapy*, according to the definition of American (AMTA), Brazilian (UBAM) and Greek (ESPEM) Association of Music Therapists, is "the clinical and evidence-based use of music by a specialized therapist, which utilizes, through scientific methods, the emotional, communicational and expressional attributes of music for therapeutic reasons and aims at the use of music and/or its elements (sound, rhythm, melody and harmony), in a therapeutic relationship, in a process to maintain and promote the mental, physical and cognitive health of a client or a group". Live music administered by a music therapist has a greater effect than recorded music,<sup>18</sup> but whether the patients participate in the music or listen to it, the music will usually have an effect on their thoughts as well as emotions.<sup>19</sup> The reason is simple and powerful; live music provided by a therapist allows individual to adjust to patients'

reactions in real time. Clinical outcome depends on the qualities of performance and expression, and on the listener's experience, all of which can be calibrated by a musician in real time if the music is live.<sup>20</sup>

Music therapy is included in many departments of integrative medicine, offering mind-body techniques designed to introduce positive thoughts, familiar images, pleasant associations, cheerful memories, peaceful mood, and enjoyable feelings. Listening to music may alone bring about an automatic change in mood. A pleasant memory or association may come to mind immediately and flood the listener with wonderful thoughts. Breathtaking images of places far and wide may also be elicited in the imagination of the listener. The effects may be profound relaxation, a peak experience of joy, or a depth of understanding or insight. It is up to the music therapist with knowledge of and input from the individual patient to select the most appropriate music and guide the individual to the most successful outcome.<sup>21</sup>

Music therapists assess the needs of their clients, determine their musical background and preferences, set goals and objectives which are consistent with the treatment plan, implement the indicated research-based protocols, and evaluate the impact of music therapy. They use all styles and genres of music, as appropriate, and may introduce any musical selection, instrument, song, improvisation, or experience.<sup>21</sup> Their role is primarily supportive and their attitude is to relate empathically to the patient. They also use specialized protocols, such as Guided Imagery through Music, Music Facilitated Stress Reduction, and Music Assisted Relaxation and Imagery.

The most widely known intervention involving the use of recorded music is the Bonny Method of Guided Imagery and Music, which is a receptive music therapy method that claims to be an effective tool in individual work as a projective device for personal growth in the normal population.<sup>22</sup> It is indicated for people who are motivated and want to explore their inner lives and to grow personally.<sup>23,24</sup> This method invites a client to go deeply into his or her personal process by way of deep relaxation followed by shorter selections of classical music, which were designed to assist deep psychotherapeutic work on different issues and problems. This method is defined as an intensive level of music psychotherapy.<sup>25</sup>

The contribution of music listening in several hospital contexts, such as in-hospital, at day-hospitals and in outpatient waiting rooms and services, has been recognized for minimizing the effects of hospitalization, among others, and directly influencing the patient's quality of life.<sup>26</sup> There are applications of music therapy and music medicine in most of the medical specialties. A non-inclusive list is outlined in Table 1. Furthermore, music therapy has been advocated in nursing homes, rehabilitation centers, schools, community centers and home. Music listening, as applied in medical settings, belongs to receptive methods of music experiences in which the client is engaged in music listening experiences and may respond

**TABLE 1.** Settings for Applying Music Therapy and Music Medicine

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**Medical Specialties**

- Surgery: during pre-, peri- or post-surgical interventions, various types of anesthesia, and surgical procedures involving many specialty areas
- Cardiology: during various interventions in the Catheterization Laboratory, Electrophysiology Laboratory, and Cardiac Care Unit
- Intensive Care Unit
- Terminal illness/HIV/Cancer units / Hospice
- Various departments/wards & units: Psychiatry, Neurology, Obstetrics/Gynecology, Neonatology, Pediatrics, Gerontology, Dentistry and
- Procedure units: Upper and Lower GI Endoscopy, Bronchoscopy, and Arthroscopy suites

**Other Settings**

- Outpatient waiting rooms and services
  - Nursing homes
  - Rehabilitation centers
  - Schools
  - Community centers
  - Home
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GI = gastro-intestinal; HIV = human immunodeficiency virus

to the music silently or verbally, or in a different modality.<sup>25</sup>

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**EFFECTS OF MUSIC LISTENING**

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Music has at least three effects on human behavior: an emotional, exciting, or stimulating effect; a discriminative or guiding function, as when a person marches, dances, or taps in time with music; and a reinforcing or pleasurable effect.<sup>27</sup> According to the American Music Therapy Association, music therapy interventions can be designed to promote wellness, manage stress, alleviate pain, express feelings, enhance memory, improve communication and promote physical rehabilitation.

In several studies involving the influence of music therapy, various effects have been observed in different clinical situations, which resulted in physiological and psychological changes. Music has been found to increase parasympathetic activity<sup>28</sup> and humoral immunity.<sup>29</sup> Therefore; it is effective in decreasing stress-induced autonomic and neuroendocrine arousal and facilitating physiological relaxation responses.<sup>30</sup>

Music can decrease pain perception through distraction or dissociation,<sup>31</sup> and decrease patient sedative and analgesic requirements, e.g. increase the sedative effect of midazolam before surgery and reduce postoperative tramadol consump-

tion.<sup>32-35</sup> In the Cardiology/ICU area, music therapy is applied for promoting relaxation, producing a sense of tranquility, reducing anxiety and also helps the individual to control pain.<sup>36-41</sup> Importantly, researchers have demonstrated that it is feasible for music to be used with mechanically ventilated patients,<sup>42</sup> and even during turning procedure.<sup>43</sup> Music therapy has been used in critically ill patients to promote and encourage rest and sleep by way of creating a peaceful atmosphere<sup>44</sup> and to promote comfort at end of life.<sup>45</sup> Furthermore, the use of headphones shuts out undesired background noise, which is common in the ICU.<sup>46</sup>

The effect of music in mechanically ventilated ICU patients has been also investigated using various physiological measures. In general, listening to music led to significant decreases in HR, RR and BP.<sup>36,41,46-49</sup> Primarily alert and responsive patients were included in these studies. Therefore, it was possible to measure anxiety in these patients using the State-Trait Anxiety Inventory (STAI).<sup>50</sup> This was done in three studies.<sup>36,41,49</sup> However, this instrument is difficult to use with a considerable number of the mechanically ventilated ICU patients. These patients often are too drowsy to respond to the questions of the measurement instrument, as a result of the administration of sedatives, which are also used to reduce anxiety and stress. Noteworthy is that sedatives can lead to over- or under-sedation which may harm the patient.<sup>51</sup>

In addition to the positive influence of music on reducing anxiety and stress in mechanically ventilated patients, Conrad et al<sup>52</sup> demonstrated that listening to music reduces stress hormone levels and decreases the need for sedative drugs. Possibly this benefit of music for the sedated, mechanically ventilated ICU patients may lie in the associated deeper level of sedation that is achieved.<sup>53</sup> In several studies, the younger age group experienced fewer effects of music therapy than the older group.<sup>49,54-56</sup>

In Almerud and Petersson's study,<sup>48</sup> the interviews revealed that the mechanically ventilated patients had no recollections of the music therapy in the ICU. It is conceivable that the relaxing effect of music contributed to the lack of recall in those patients. Had the patient been given more time it is possible that more information would have been elicited. Letting the patients listen to music during the interview may have been another means of prompting memory recall. It is possible that the patient is more inclined to remember music therapy if he or she is a habitual listener to music. The most important is that the music was a "happy memory" among so many bad memories of intensive care they finally recalled.<sup>57</sup>

Mckinney<sup>58</sup> found that music stimulated the immune system. A lowering of beta endorphin levels has also been found in conjunction with music therapy. Myskja and Lindbaek<sup>59</sup> are of the opinion that music can influence the balance of hormones, such as a reduction of adrenal corticotropin hormone (ACTH) and other stress hormones. Sutoo and Akiyama<sup>60</sup> have shown that music improves dopaminergic neurotransmission in diseases

such as hypertension or epilepsy; peripheral calcium was transported to the brain, leading to increased brain dopamine levels. Furthermore, data suggest that music might help normalize intestinal motility in ICU patients leading to improved enteral nutrition, reduced need for parenteral support, and lessened risk of long-term adverse sequelae of intestinal non-use.<sup>61</sup> A number of experiments have been conducted with regard to the effects of musical stimuli on the digestive system. Changes in digestion, internal secretions, and even assimilation and nutrition have been recorded.<sup>62</sup>

The ability of music to increase physical work activity has been documented for 2800 years. In ancient Greece, the guitar and flute music was played during the Olympic Games with the goal of improving athletic performance.<sup>63</sup> Tarchanoff found an effect on muscular activity, which increased or diminished according to the nature of the music played.<sup>62</sup> Also, skin temperature changes have been noted in people listening to music.<sup>64</sup>

In patients with neurocardiogenic syncope, listening to relaxing music decreases stress and arousal during head-up tilt testing and change the response to the tilt test. This may imply an effect on music on central nervous mechanisms involved in the development of syncope during tilting.<sup>65</sup> Music seems to modify the neuroendocrine profile related to neurocardiogenic syncope and it may also alter the response to tilt-testing.<sup>66</sup> Furthermore, listening to music leads to a significant reduction in subjective perception of stress during treadmill exercise.<sup>67</sup>

Noteworthy is that Bradt and Dileo<sup>68</sup> reviewed all randomized controlled trials that compared music interventions and standard care with standard care alone for persons with coronary heart disease. Twenty-three trials involving 1461 participants were included. Music listening was the main intervention used, and 21 of the studies did not include a trained music therapist. Results indicated that music listening has a moderate effect on anxiety in patients with coronary heart disease; however results were inconsistent across studies. This review did not provide strong evidence for reduction of psychological distress. Findings indicated that listening to music reduces HR, RR and BP. Studies that included two or more music sessions led to a small and consistent pain-reducing effect. No strong evidence was found for peripheral skin temperature. None of the studies considered hormone levels and only one study considered quality of life as an outcome variable.

The power of music to affect memory is quite intriguing. Mozart's music and baroque music, with a pattern of 60 beats per minute, activate both the left and right brain. The simultaneous left and right brain action maximizes learning and retention of information.<sup>63</sup> Furthermore, a study of the effects of music on headache, showed significant results, as all subjects with stress headaches reported their headaches were eliminated or gone after a 30-minute session of music and Somatron. A Somatron is an acoustic massage reclining chair. The music used was recorded American Indian wooden flute music.<sup>69</sup>

Watkins<sup>70</sup> suggested that music will influence the limbic

system of the brain, the center of emotions, feelings and sensations, by reducing neurotransmitter ability to relay uncomfortable feelings. The contribution of music therapy has been also recognized for minimizing the effects of hospitalization, and directly influencing the patient's quality of life,<sup>26</sup> improving satisfaction with overall treatment during hospitalization<sup>71</sup> and reducing the average length of hospital stay.<sup>72</sup> In general, music, except for creating positive mood, improves personal satisfaction and gives higher motivation to live.

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### MUSIC FOR RELAXATION

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Music can be used therapeutically for music-centered relaxation as a perceptual focus and stimulus.<sup>73</sup> Musical selections with slow, flowing rhythms that duplicate pulses of 60 beats per minute are characteristics of music for relaxation.<sup>74</sup> Music exerts its effect via entrainment or synchronization of body rhythms with those of musical selection.<sup>75</sup>

Relaxation is defined as a "physical state of becoming less tense or tight in the muscles; and psychologically to feel relaxed in the sense of feeling free from nervous anxiety and disturbing tensions. A relaxed body can be described as a state in which the muscles of the entire body are in a state of balance. The relaxed feeling is the one of weightlessness".<sup>76</sup>

Four steps are considered essential to elicit the relaxation response:<sup>77</sup> A quiet environment; a mental device such as a sound, word, phrase or prayer repeated silently or out loud; a passive attitude by not worrying how well one is performing, and putting away distracting thoughts to return to one's focus; and a comfortable position.

The characteristics of potentially sedative/relaxing music are defined by the following elements:<sup>78</sup> stable tempo, stability or only gradual changes in volume, rhythm, timbre, pitch and harmony, consistent texture, predictable harmonic modulation, appropriate cadences, predictable melodic lines, repetition of material, structure and form, gentle timbres and few accents.

The potential of music to reduce anxiety and increase relaxation in an individual depends on factors such as familiarity and preference with respect to the music being listened to, as well as their current mood, and previous music training.<sup>79</sup> Patient's preference is the key to the effectiveness of the music intervention.<sup>80</sup>

There are more reasons for asking patients about their preferred style of music for relaxation. First of all, participant's responses to music cannot be predicted specifically as individuals may show opposite responses to the same music.<sup>75</sup> Also, a music therapy intervention based on the subject's preferred style of music for relaxation will provide the patient with some influence on their treatment and thus possibly reduce the patient's experience of loss of control.<sup>81</sup> Moreover, if the patient is familiar with the music style, the music may function

as a bridge to the normal life situation.<sup>82</sup>

"Classical" music has been shown to reduce circulating cortisol levels, so it might be useful in hemodynamically stable critically ill patients to prevent hypercortisolemia and resulting deleterious effects. "Techno" (electronic dance) music increases beta-endorphin, norepinephrine, ACTH and cortisol, so it might prove valuable in hemodynamically unstable patients to serve as an adjunct to vasopressors or cardiac stimulants.<sup>61,83</sup> However, this remains rather a speculation in practice, as techno music was found to be associated with a significant increase in HR, BP and significant changes in self-rated emotional states.<sup>83</sup> This music encourages rage, disappointment and aggressive behaviour.<sup>63</sup>

The greatest benefit on health is visible with classical music and meditation music, whereas heavy metal music or techno are not only ineffective but possibly dangerous and can lead to stress and/or life-threatening arrhythmias. Hip hop and Rap are less frequently effective due to the sounds, but can often have an effect due to their words – the important element of which is the rhyme structure. The music of many composers most effectively improves quality of life, will increase health and probably prolong life, particularly music by Bach, Mozart or Italian composers.<sup>63</sup>

In Dritsas et al study,<sup>84</sup> 78% of patients showed a greater than 50% reduction in stress with music according to visual analogue scale analysis. In the sample assessed, only 18% of patients preferred classical music to achieve relaxation compared to 82% of patients who preferred pop or traditional music, which means that classical music may be ideal only for those grown up in the particular culture and culture aspects are very important in the choice of pre-recorded music. Also, the most preferred relaxative type of musical instrument was flute (by 92% of patients) and natural sounds of rain or flowing water (by 96% of patients), and 78% of patients indicated color blue or green as the most common visual representation of relaxation. In conclusion, the vast majority of patients indicated a strongly positive attitude towards music in a hospital setting including the cardiac ICU.

Specific recommendations for the optimal duration of a listening to relaxing music session have not been reported. Often the music listening sessions used lasted 20-35 minutes (maximum 90 minutes).<sup>80</sup> In relation to music interventions offered pre-operatively right up to the moment of the anesthesia in function sessions is suggested to be of 15 minutes duration. The range of 70 to 105 decibels is suggested as a preferred loudness of music for patients.<sup>85,86</sup> Some important factors to consider when scheduling music therapy interventions are summarized in Table 2. Particularly for the ICU setting, one may consider individual delivery of music with headphones as their use shuts out undesired background noise, which is common in this setting.

**TABLE 2.** Factors to Consider when Scheduling Music Therapy Interventions

- Music will be relaxing only if it is enjoyed, but may have an undesirable effect if not enjoyed
- Interventions should be related to preferred music
- Cultural aspects are important
- Music should not be played continuously as it can lead to irritation rather than a state of well-being
- Exposure to intense acoustic stimulation must be carefully controlled and monitored to avoid the possibility of producing damage to hearing or other areas of the nervous system
- Individual delivery in ICU with headphones; the use of headphones shuts out undesired background noise, which is common in the ICU setting

ICU = intensive care unit

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### CONCLUSION

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Music therapy is widely reported in the medical literature. There has been substantial progress in the establishment of research strategies for supporting clinical practice. Music can be used as a safe and inexpensive non-pharmacologic anti-anxiety intervention to enhance relaxation and decrease stress in ICU patients. Live music is considered more important than pre-recorded music and different types of music (e.g. stimulating vs. relaxing music) and music preference of the individual patient may have a different effect.

Research shows that music can influence a wide range of physiological and psychological effects. It is proposed that music therapy, instituted as an adjunct means of modulating BP, HR, RR, gastric motility, and physiologic stress pathways, can improve ICU outcomes for critically ill patients. Furthermore, music provides a way of filtering out unpleasant and unfamiliar sounds which are part of the hospital environment, but should be applied appropriately and judiciously.

New healthcare facilities and programs face a gauntlet of design requirements: to incorporate all relevant and proven evidence-based design innovations to optimize patient safety, quality, and satisfaction as well as workforce safety, satisfaction, productivity, and energy efficiency. The clinical use of music is both an innovative and an evidence-based practice that has been proven both to satisfy patients and to lower the cost of care.

The key implication is to educate doctors and nurses on modern aspects of music therapy. However, further studies are necessary to evaluate how music can be further integrated clinically and elucidate the precise underlying mechanisms of its beneficial effects, or how to deliver music in an optimal way, i.e. via loudspeakers, headphones, or audio-pillow, and analyze the results according with the cultural group, age, gender, and other pertinent parameters.

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