Music Therapy and Mechanical Ventilation:

A Survey of Current Practice

by

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Abstract

Mechanical ventilation is a life support measure in which an endotracheal tube or tracheostomy is attached to a mechanical ventilator to mechanically breathe for an individual who has lost the ability to do so. The need for mechanical ventilation can be a result of respiratory illness, or a neurological impairment caused by a drug overdose, spinal cord or brain injury. This procedure results in many uncomfortable symptoms such as anxiety, pain, and delirium. The use of music listening to treat these symptoms has been researched showing an overall support for the implication of music. However, music therapy research with mechanically ventilated individuals is very limited. A survey was conducted to gain an understanding of current music therapy practice with mechanically ventilated individuals and to add to the knowledge base. Music therapists reported that the most common methods and goal addressed in music therapy were listening to live music and physiological entrainment to reduce anxiety. Music therapists also had a high rate of involvement during weaning trials. Current music medicine and music therapy research focus on the use of music listening to reduce anxiety as evidenced by both psychological and physiological changes such as heart rate, respiratory rate, and blood pressure. The responses provided by the music therapist's surveyed mirrors current research on the methods used and goals addressed with mechanically ventilated patients further demonstrating the feasibility of music therapy for mechanically ventilated individuals. The present study can serve as a basis of knowledge for music therapists and medical professionals considering music therapy for mechanically ventilated individuals.

Keywords: music therapy, music medicine, mechanical ventilation

Music Therapy and Mechanical Ventilation: A Survey of Current Practice

Mechanical ventilation is a supportive device used to manually inflate and deflate an individual's lungs when their own ventilatory abilities are lost (Tobin & Manthous, 2017). It is one of the most common intensive care unit (ICU) interventions and one of the primary reasons for admission into the ICU (Goldsworthy & Graham, 2014). Annually, in the United States, more than one million individuals admitted to the ICU receive mechanical ventilation (Walter et al., 2018). To promote tolerance and synchronicity (matching of patient inspiratory and expiratory efforts to the settings on the ventilator), patients are given powerful intravenous drugs often for prolonged periods of time. This prolonged period of potent medication can lead to adverse effects such as anxiety, bradycardia, hypotension, gut dysmotility, immobility, weakness, and delirium (Arroliga et al., 2008).

Mechanical Ventilation

Mechanical ventilation is a form of life support. A mechanical ventilator is a machine that takes over the work of breathing for a patient who cannot breathe on their own. A ventilator is used to deliver high amounts of oxygen to the lungs, to allow to body to take a break from the work of breathing to focus on healing, and to breathe for patients with neurological impairments such as brain injury or unconsciousness from infection or overdose (Tobin & Manthous, 2017). Mechanical ventilation employs the use of an endotracheal tube inserted through the nose or mouth into the windpipe. If there is a blockage in the trachea or the mechanical ventilation will be prolonged, the mechanical ventilator can be connected to a tracheostomy instead. A tracheotomy involves making a hole in the patient's neck and trachea and the tube is inserted into the hole, which then connects to the ventilator (Tobin & Manthous, 2017).

Modes of Mechanical Ventilation

Ventilators and ventilation modes have evolved significantly over the past 50 years. The iron lung is one of the first ventilators, that had very simplistic modes to support a patient with respiratory failure (Kacmarek, 2011). The recent advancement in ventilators and ventilation modes is attributed to the recent expansion of available research and technology (Kacmarek, 2011). Modern ventilators offer a variety of modes. The most effective mode for the patient is determined by the physician with an emphasis on patient comfort, safety, and lung protective strategies. Mechanical ventilation can either be invasive or noninvasive. Invasive mechanical ventilation employs the use of an endotracheal tube or tracheostomy attached to a mechanical ventilator (Walter et al., 2018). The modes of invasive mechanical are either volume targeted or pressure targeted (MacIntyre, 2011). Noninvasive mechanical ventilation employs the use of a face mask (Morton & Fontaine, 2013).

Volume Targeted Modes of Invasive Mechanical Ventilation. In volume-targeted invasive mechanical ventilation, the ventilator performs all of the work of breathing, without the patient initiating any effort. This mode is useful for patients with neurological conditions, who experience apnea or are unable to initiate their own breaths. It is also used to fully rest the patient's diaphragm and respiratory muscles to provide an opportunity for underlying respiratory conditions to heal (Grossbach et al., 2011). However, volume targeted modes of mechanical ventilation can increase the work of breathing, create anxiety, and shortness of breath when a patient attempts to initiate a breath and the flow rate does not match their initiation (Pierce, 2007). Additionally, patients often require sedation and paralytics to maintain mechanical ventilation due to this desynchrony between patient and ventilator-initiated breaths (Pierce, 2007). Attention to and alteration of the flow-rate setting of the ventilator are essential

considerations for patient comfort for this mode of mechanical ventilation (Grossbach et al., 2011). Assist/control is an example of a volume-targeted mode of mechanical ventilation that does not allow for patient initiated spontaneous breaths between the preset respiratory rate (Pierce, 2007). However, synchronized intermittent mandatory ventilation is the same as assist/control, but does allow for patient initiated spontaneous breaths in between the breath set on the ventilator (Pierce, 2007; Walter et al., 2018).

Pressure Targeted Modes of Invasive Mechanical Ventilation. Pressure targeted invasive mechanical ventilation differs from volume targeted invasive mechanical ventilation in that the breaths are primarily patient initiated. Volume targeted invasive mechanical ventilation employs the use of a set flow. Flow is determined by the set pressure, patient demand, resistance, compliance, and the algorithm of the ventilator in pressure targeted invasive mechanical ventilation (Grossbach et al., 2011; Walter et al., 2018). There are two main modes of pressure targeted invasive mechanical ventilation, pressure support and pressure control. Pressure support relies solely on patient initiated breaths, and augments the breaths provided by the patient to a preset pressure. Pressure control either augments spontaneous breaths to a preset pressure, or initiates breath mechanically to a preset pressure if needed (Grossbach et al., 2011; Walter et al., 2018). Similar to volume targeted invasive mechanical ventilation, pressure control invasive mechanical ventilation can cause patient-ventilator desynchrony requiring the use of sedation and paralytic medicine to maintain this mode (Pierce, 2007).

Noninvasive Mechanical Ventilation. Noninvasive mechanical ventilation does not use an endotracheal tube. Instead, a tight-fitting mask covering the mouth and nose is used. Bilateral positive pressure of oxygen is the means of oxygen delivery through the mask (Morton & Fontaine, 2013). Contraindications of this mode are claustrophobia, thick or copious oral

secretions, and recent facial or gastroesophageal surgery (Goldsworthy & Graham, 2014). Nursing management for this mode of ventilation includes ensuring correct mask size, continuous assessment of skin under mask for signs of breakdown, use of a chin strap for mouth breathers, monitoring for dry eyes due to escaping gas from the mask, monitoring of dry mouth due to external humidification, and cautionary measures to prevent food aspiration (Goldsworthy & Graham, 2014).

Indications of Prolonged Sedative Exposure

Oftentimes patients who are mechanically ventilated need sedative and paralytic medicine to maintain their mode of invasive mechanical ventilation (Pierce, 2007). This prolonged period of sedative exposure can lead to adverse effects such as anxiety, bradycardia, hypotension, gut dysmotility, immobility, weakness, and delirium (Arroliga et al, 2008). Effective non-pharmacological interventions are needed to reduce sedative exposure to lessen the unpleasant effects that arise from prolonged sedative exposure due to mechanical ventilation (Tracy & Chan, 2011). Music listening has been found to be a way to manage some of these unpleasant symptoms such as anxiety, pain, weaning, need for sedative medicine, and delirium. Multiple research studies have shown that listening to music can reduce perceived anxiety as well as reduce physiological measures related to anxiety such as respiratory rate, blood pressure, and heart rate in mechanically ventilated patients (Bradt & Dileo., 2014a).

Reducing sedative exposure would not only provide physical benefits, but economic benefits as well. The use of music intervention can reduce the need for sedative medication, therefore reducing the cost of treatment for that day. The use of music intervention can reduce daily ICU costs by $2,155 compared to usual care (Chlan et al., 2018). This economic benefit is especially relevant considering the recent increase in mechanically ventilated patients due to the

COVID-19 pandemic. Up to 33% of patients hospitalized with COVID-19 received mechanical ventilation and up to 89.9% of patients in the ICU received mechanical ventilation due to COVID-19 (Wunsch, 2020). Music interventions can be a way to reduce the costs associated with the recent increase in mechanically ventilated patients by being a means of non-pharmacological intervention.

Literature Review

Symptoms Related to Mechanical Ventilation

The ventilator itself does not cause pain, but the experience of mechanical ventilation can still have uncomfortable symptoms (Tobin & Manthous, 2017). When mechanically ventilated, a person is unable to talk and eat, and the tube can cause gagging or coughing. To promote comfort and synchronicity with the ventilator, potent sedative and neuromuscular agents are used, which come with their own symptomology (Tobin & Manthous, 2017).

Psychological symptoms

Mechanical ventilation can often cause major anxiety and distress in patients. Mechanically ventilated patients experience many psychological symptoms resulting from their physical state that cause distress. These symptoms include anxiety, depression, impaired well-being, uncertainty regarding surroundings or condition, discomfort, isolation from others, and fear (Bradt & Dileo, 2014a; Jacobs et al., 2021; Lindgren & Ames, 2005; Wong et al., 2001). Increased anxiety can be detrimental to weaning attempts, which is when patients are removed from mechanical ventilation to build independence from mechanical support, and may result in difficulty breathing (Boles et al., 2007; Lindgren & Ames, 2005). Constriction of arteries and airways can also result from increased anxiety, causing more discomfort for the patient (Bradt & Dileo, 2014a). Current standards of practice for mechanically ventilated patients stress the

importance of the use of analgesic and sedative medication to treat anxiety (Goldsworthy & Graham, 2014). However, these medications and others used to manage mechanical ventilation can cause adverse physical effects as well (Suter, 2002). There is a need for nonpharmacological ways to reduce anxiety and other unpleasant psychological symptoms of mechanical ventilation to combat the need for such intense sedative medication (Tracy & Chan, 2011).

Physical symptoms

To promote tolerance and synchronicity, mechanically ventilated patients are given potent intravenous drugs for prolonged periods of time. This prolonged exposure results in many unpleasant physical symptoms such as bradycardia, hypotension, gut dysmotility, immobility, weakness, and delirium (Arroliga et al., 2008). The immobility resulting from sedation can contribute to venous thrombosis and pressure damage to the nerves and skin (Suter, 2002). Additionally, immune response is weakened from extensive use of sedative medications (Suter, 2002). Mechanically ventilated individuals also experience tiredness, drowsiness, pain, shortness of breath, lack of appetite, and nausea (Jacobs et al., 2021). These physical side effects may lead to the prolongation of mechanical ventilation and therefore, a longer, more expensive, hospital stay (Bobek, 2001; Egerod, 2002). Nonpharmacological means to increase sedation are needed to reduce the physical symptoms resulting from pharmacological treatment (Tracy & Chan, 2011). Music medicine, defined as the use of music intervention by a medical professional, has been found to reduce sedative exposure in mechanically ventilated patients demonstrating the potential effectiveness of music listening as a nonpharmacological intervention to reduce the need for sedative medication (Beaulieu-Boire et al., 2013; Chlan et al., 2018; Chlan et al., 2013; Dijkstra, 2010; Khan et al., 2020; Liu et al., 2020).

Standard of Care for Related Symptoms

Current standards of care to manage symptoms resulting from mechanical ventilation rely mostly on pharmacological intervention such as the introduction of sedatives and paralytics (Goldsworthy & Graham, 2014; Pierce, 2007). However, Tracy and Chan (2011), discuss several important nonpharmacological approaches to be taken to address the comfort of critically ill ventilated patients:

- the minimization of noise
- access to sunlight to promote natural sleep/wake patterns
- relaxation techniques (progressive muscle relaxation, massage),
- communication with family about patients' premorbid habits that can be replicated in the medical setting
- animal-assisted therapy
- imagery
- the promotion of a presence (physical, psychological, active listening, being attentive)
- comfortable positioning
- music intervention that considers patient preference, volume, and duration

These approaches are expressed and integrated in the education of nurses who care for mechanically ventilated patients. The integration of both pharmacological and nonpharmacological interventions is essential for the management of the psychological and physical symptoms that arise from mechanical ventilation (Goldsworthy & Graham, 2014).

Music Medicine in Medical Settings

The use of music interventions in medical settings can be categorized as music medicine or music therapy. Music medicine involves the use of pre-recorded music by a healthcare professional or self-administered by the patient. (Bradt & Dileo, 2014a). Music therapists individualize interventions to meet patients' specific needs, actively engage the patients in the music making, and employ a systematic therapeutic process, including assessment, treatment, and evaluation (Bradt & Dileo, 2014a).

Music Medicine and Symptom Management

Cochrane reviews published within the past 10 years have reported the efficacy of music medicine interventions to manage symptoms similar to those experienced by mechanically ventilated patients such as perceived anxiety in coronary heart disease patients (Bradt, Dileo, & Potvin, 2013), anxiety, quality of life, depression, hope, fatigue and pain in cancer patients (Bradt et al., 2021), and preoperative anxiety (Bradt, Dileo, & Shim, 2013). Additionally, these reviews noted that patient music preference should be considered for the greatest outcome potential (Bradt et al., 2021; Bradt, Dileo, & Potvin, 2013; Bradt, Dileo, & Shim, 2013) and patient selected music resulted in greater anxiety reducing effects in patients with coronary heart disease (Bradt, Dileo, & Potvin, 2013).

Bradt, Dileo, and Potvin (2013) updated their 2009 Cochrane review that focused on the beneficial effect of music interventions on anxiety and physiological response in patients with coronary heart disease. This systematic review reported that listening to music has a moderate effect on anxiety, especially when patient’s music preference is considered, and can provide a beneficial effect on systolic blood pressure, heart rate, respiratory rate, quality of sleep, and pain in patients with coronary heart disease. Bradt et al. (2021) reported similar outcomes in their

review of the effects of music interventions used in cancer treatment. Specifically, they found that music interventions had a large effect on anxiety and quality of life, a moderate effect on depression and pain, and a small effect on hope and fatigue. Finally, Bradt, Dileo, and Shim (2013) found that music listening had a beneficial effect on preoperative anxiety. Specifically, anxiety reduction was, on average, 5.72 units greater than standard care as measured by the State-Trait Anxiety Inventory (STAI-S). The results also suggested a small effect on heart rate and diastolic blood pressure. In all three reviews, music listening was the primary music intervention used (Bradt et al., 2021; Bradt, Dileo, & Potvin, 2013; Bradt, Dileo, & Shim, 2013). The ability for music listening to reduce anxiety and manage other symptoms related to medical treatment is supported by the consistent findings of the Cochrane reviews mentioned.

Medical Music Therapy

Music therapy is the use of individualized music experiences based on an assessment to address the health needs of a patient. In music therapy the therapeutic relationship is considered, and the use of music is more varied and may include the use of receptive, improvisational, re-creative, and compositional methods (Bruscia, 2014). A treatment plan indicating clinical goals is developed after an assessment (Bradt & Dileo, 2014a) Music therapists hold a bachelor's degree or higher and complete 1200 hours of supervised internship before graduation. Upon graduation, music therapists take a board certification exam to acquire the MT-BC (Music Therapist, Board Certified) credential, a necessary requirement for professional practice (American Music Therapy Association [AMTA], 2022).

Bruscia (2014) defines four levels of medical practices: auxiliary, augmentative, intensive, and primary. Each level is informed by the role of the music and the client-therapist relationship, whether the goals for music therapy are of primary or secondary medical

significance, the length of medical treatment, and the clinical setting (Bruscia, 2014). Auxiliary medical music practices do not require a therapeutic relationship music therapist and can be self-administered (e.g., personal use of music to relax body or reduce stress) or functionally administered (e.g., music in waiting rooms, recreational music activities provided by hospital staff). Augmentative medical music therapy practices employ the use of the therapeutic relationship to work with the patient to relieve immediate symptoms from an illness or medical procedure. The treatment is often brief, usually with only one or two sessions over a short period of time. Intensive medical music therapy practices have a strong reliance on the therapeutic relationship and aim to address significant medical needs of the patient over an extended period of time. The goals address a wide spectrum of needs that arise during illness and treatment such as can be biomedical, emotional, interpersonal, social, spiritual, and ecological, rehabilitative, or palliative needs. Finally, primary medical music therapy exists only under two conditions: when the work leads to significant changes in the specific health condition being addressed, and when the goals extend beyond medically centered, and become centered in other areas of practice (e.g., psychotherapy) (Bruscia, 2014).

Medical Music Therapy and Symptom Management

Many of the physiological and psychological symptoms experienced by patients receiving mechanical ventilation are commonly treated by music therapists working in medical settings. For example, physiological variables such as heart rate and respiratory rate are commonly addressed in music therapy (Golino et al., 2019; Teckenberg-Jansson, 2019). Psychological variables are also addressed by music therapists in medical settings such as anxiety (Golino et al., 2019), pain (West & Silveman, 2020) end of life care (Bradt & Dileo, 2014b), and procedural support (Bradt, Dileo & Shim, 2013). Of these, anxiety and reduction in

heart rate and respiratory rate are some of the most commonly addressed goal areas in medical music therapy. Music therapy research with mechanically ventilated individuals is very limited. However, there is a substantial body of research that supports the use of music therapy to reduce anxiety in patients in various medical settings with statistically significant results (Crawford et al., 2013; Golino et al., 2019; Rosenow & Silverman, 2014; Teckenberg-Jansson, 2019; Yates & Silverman, 2015; Zhou et al., 2015). Given that anxiety is one of the most common symptoms experienced by individuals who are mechanically ventilated (Tate et al., 2012), the next section will summarize the music therapy research related to anxiety reduction in medical patients.

Receptive Methods. Receptive music therapy experiences engage patients in music listening. Patients then respond to the music silently, verbally, or through another modality (Bruscia, 2014). Music used in receptive methods may be live or recorded and can focus on the physical, emotional, intellectual, aesthetic, or spiritual aspects of the music and the patient's response to them. Common goals in receptive music therapy experiences are to stimulate or relax, evoke affective states and experiences, explore ideas, facilitate memory, and to evoke imagery (Bruscia, 2014). The nature of the receptive music therapy experiences described below is often live preferred music with the goal of relaxation and induction of beneficial physiological changes.

Anxiety. Anxiety is frequently reported by patients as a symptom of mechanical ventilation (Tate et al., 2012). Anxiety can manifest both physiologically and psychologically. There is a robust body of literature demonstrating the efficacy of music therapy interventions in reducing anxiety among patients with a variety of medical conditions including, patients receiving solid organ transplants (Crawford et al., 2013), patients recovering for bone marrow

transplants (Rosenow & Silverman, 2014), patients in the ICU (Golino et al., 2019), and patients in the post-surgical oncology unit (Yates & Silverman, 2015).

Crawford et al. (2013) aimed to determine the effect of single session music therapy on anxiety, relaxation, mood, and perception of side effects in patients hospitalized due to being solid organ transplant donors or recipients. Participants were randomly assigned to either experimental or wait-list conditions. Participants in the experimental condition were given the choice to engage in patient-preferred live music or a harmonica lesson. Thirty-seven participants chose the receptive live music condition while only one chose the harmonica lesson. There were significant between-group posttest differences in anxiety, relaxation, and mood indicating that single session music therapy has potential to be an effective psychosocial intervention to reduce anxiety and other symptoms for solid organ transplant patients.

Rosenow and Silverman (2014) examined the effect of single music therapy sessions on relaxation, anxiety, and fatigue experienced by patients recovering from bone marrow transplants. The music therapists played live preferred music on guitar for 30-45 minutes, encouraging verbal interaction in between songs. The researchers used five separate 10-point Likert type scales to assess patients' relaxation, anxiety, fatigue, nausea, and pain before the music therapy session began (pre-test), at the conclusion of the session (post-test), and 30–45 min after the music therapy session concluded (follow-up). Results were statistically significant in pre- and post-test scores in areas of relaxation, anxiety, and fatigue. Follow up scores reported that participants in the music listening group maintained improvement from pre-test scores as well, implying that a single music therapy session can provide relaxation and anxiety reducing benefits even 30-45 minutes after treatment.

Golino et al. (2019) examined the effect of single session music therapy on pain, anxiety, heart rate and respiratory rate on patients in the intensive care unit. Patients used a bedside monitor to self-report symptom intensity using a Likert scale. Significant decreases in all physiological and psychological outcome measures were reported. The music therapy experience was patient choice of receptive music listening to either relaxing or preferred music. The results of this study support music therapy as a nonpharmacological intervention in intensive care units to reduce anxiety, pain, heart rate, and respiratory rate. Teckenberg-Jansson (2019) researched the effects of music therapy on heart rate variability, anxiety, and self-reported stress among hospitalized women with high-risk pregnancies. Participants in the music therapy group received 30 minutes of live music therapy for three consecutive days. The results indicated a significant decrease in anxiety for the women in the music therapy group evidenced by a decrease in heart rate and self-reported stress levels.

In a randomized effectiveness study, Yates and Silverman (2015) observed the immediate effects of a single music therapy session on mood and relaxation for patients in a post-surgical oncology unit. Participants in the experimental group received 20-30 minutes of patient preferred live music therapy. The method of assessment was a self-reported pre- and post-test mood scale. There were significant post-test between-group differences in relaxation/anxiety with experimental participants having more favorable post-test scores than control participants. This indicates that patients in a post-surgical oncology unit experienced decreased anxiety and increased relaxation following music therapy intervention. Also, Zhou et al. (2015) examined the effect of guided progressive muscle relaxation with music on anxiety, depression, and length of stay in Chinese female breast cancer patients after radical mastectomy. A general linear model with univariate analysis showed that the intervention group patients had

statistically significant results in areas of depression, anxiety and length of hospital stay. The results of this study demonstrate that music therapy and progressive muscle relaxation training can reduce depression, anxiety, and length of hospital stay for female breast cancer patients after radical mastectomy.

Music Medicine with Mechanically Ventilated Patients

The literature on the use of music medicine with those on mechanical ventilation is limited and includes a Cochrane review (Bradt & Dileo, 2014a), two systematic reviews (Davis & Jones, 2012; Hetland et al., 2015), 22 quantitative research studies, and three descriptive clinical papers.

Systematic Reviews

Bradt and Dileo (2014a) updated their original Cochrane review, *Music interventions for mechanically ventilated patients (review)*. Fourteen studies were included in the updated review, of those only one met the criteria for music therapy and the remaining 13 met criteria for music medicine. Music medicine studies included in the review investigated the use of pre-recorded music and the music therapy study incorporated live music. Main findings suggest that music listening may reduce anxiety in mechanically ventilated patients. Further, music listening was consistently shown to reduce respiratory rate and systolic blood pressure suggesting a relaxation response. Additionally, a reduction in sedative and anesthetic intake was reported. There was not a difference between the effect of live music or pre-recorded music on anxiety reduction, or changes in physiological measures. Based on these findings, and that of other Cochrane reviews on music intervention in medical settings (e.g. Bradt et al., 2021; Bradt, Dileo, & Potvin, 2013; Bradt, Dileo, & Shim, 2013), it appears that music listening is a viable option for anxiety reduction and increased relaxation in patients who are mechanically ventilated.

Systematic reviews conducted by Davis and Jones (2012) and Hetland et al. (2015) report similar findings. Davis and Jones (2012) reviewed seven quantitative studies, all of which would be classified as music medicine. Results of this review noted that listening to prerecorded music through headphones resulted in statistically significant changes in the respiratory rate, heart rate, and blood pressure. Hetland et al. (2015) reviewed 16 quantitative and two qualitative research studies to determine if music interventions were effective in lessening symptoms relating to mechanical ventilation and weaning such as anxiety and increased respiratory effort. They concluded that the evidence supports music as an effective intervention to promote effective weaning while also reducing anxiety in patients receiving mechanical ventilation.

Music Medicine Research

The research studies that exist on the efficacy of music medicine with those who are mechanically ventilated further demonstrate the potential benefits of using music with this population. The main area of interest in these music medicine studies was the effect of the music intervention on reducing anxiety (e.g., Chlan et al., 2013; Han, 2010; Korhan, 2011; Lee et al., 2005; Lee, Lai et al., 2017; Lee, Lee et al., 2017; Park & Park, 2019**;** Wu & Chou, 2008). The effect of music interventions on weaning trials (Liang et al., 2016), pain (Jacq et al., 2018; Yaman, 2016), comfort (Liu et al., 2020; Mateu et al., 2019), and delirium (Browning et al., 2020; Khan et al., 2020) have also been researched. Finally, economic benefits such as reduction in ICU costs and narcotic and sedative medicine consumption (Beaulieu-Boire et al., 2013; Chlan et al., 2018; Chlan et al., 2013; Dijkstra, 2010; Khan et al., 2020; Liu et al., 2020) were also examined. Of these 21 meet the criteria for music medicine and one meets the criteria for music therapy (Hunter et al., 2010). Table 1 provides a complete list of related studies and their outcomes.

Table 1

Music Medicine Studies Summary

Author/Year	Music Intervention	Dependent Variables	Outcome
Anxiety			
Chlan et al. (2013)	Self-initiated patient-directed music (PDM) administered through headphones (patient music preference assessed by music therapist).	Reduce anxiety (VAS-A) and sedative drug exposure (dose and frequency).	PDM patients had significantly lower VAS-A scores than those in the control group. There was a significant interaction between the PDM group and time, which showed a decrease in sedation intensity and sedation frequency over time (per day) for the PDM group only.
Han (2010)	Patient selected music from 40 choices from 4 categories of	Anxiety measured with the C-STAI and physiological measures (heart rate,	Statistically significant differences in C-STAI scores and

	relaxing, slow tempo music familiar to Chinese people administered through headphones.	respiratory rate, blood pressure).	physiological measures before and after intervention *(p* < 0.001).
Korhan (2011)	Patients listened to classical music at 60-66 bpm through headphones for 60 minutes.	Physiological signs of anxiety such as systolic and diastolic blood pressure, pulse rate, respiratory rate and oxygen saturation in blood measured by pulse oxymetry.	The music group had significantly lower respiratory rates, and systolic and diastolic blood pressure, than the control group. This decrease improved progressively in the 30th, 60th and 90th minutes of the intervention, indicating a cumulative dose effect.
Lee et al. (2005)	Music listening through headphones of music chosen by	The subjects were asked to answer the C-STAI scale before	Significant decreases in the anxiety-related, physiological

	the patient from a selection provided by the researchers for 60 minutes.	and after the study period.	outcome measures (RR, HR, SBP and DBP) were found for the music group in the post-test period, and significant differences on post-pre values of RR and HR between the music and control groups were found.
Lee, Lai et al. (2017)	Music listening through headphones of music chosen by the patient from a selection provided by the researchers for 30 minutes.	Anxiety was measured using the C-STAI and VAS-A at baseline, post-test, and 30-min follow-up. Heart rate, breathing rate, and blood pressure were measured every 10 min from baseline to the 30-min follow-up.	The Music group had significantly better post-test VAS-A and C-STAI scores and had lower heart rate and blood pressure than the Control group and the effects of the intervention were maintained for 30 minutes.

Lee, Lee et al. (2017)	Music listening through headphones of music chosen by the patient from a selection provided by the researchers for 30 minutes.	Anxiety measured with the C-STAI and VAS-A. Heart rate, and blood pressure.	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.
Park & Park (2019)	Six patients listened to preferred music choices or classical relaxation music through headphones for 30 minutes.	Anxiety measured using the RASS, STAI, VAS-A.	Significant decrease in agitation and anxiety after both the preferred and classical relaxation music interventions.
Wu & Chou (2008)	Music listening through headphones of relaxing music for 30 minutes.	Anxiety measured using VAS-A, diastolic blood pressure and respiratory rate.	Sense of anxiety and breathing rate decreased significantly following music listening.
Weaning Trials			

Liang et al. (2016)	Music listening to patient selected music informed by a music preference questionnaire for 60 minutes during mechanical ventilation weaning trials.	Outcome measures were heart rate, respiratory rate, oxygen saturation, blood pressure, dyspnea and anxiety assessed with VAS-A and weaning duration (mean hours per day).	Significant decreases in HR, RR, VAS-A, and VAS-D and a significant increase in daily weaning duration on music days ($p < 0.05$).
Pain			
Jacq et al. (2018)	Listening to Mozart music through headphones during and 30 minutes after morning bed bath.	Pain (BPS) collected during and 30, 60, and 120 minutes after the bed bath.	The maximum BPS score achieved (pain intensity) and the time spend at maximum or >5 BPS pain level (pain duration) was significantly lower in the music group.
Yaman (2016)	Music listening to classical music through headphones for 30 minutes.	Pain intensity indicated by assessment of physiological	No significant findings.

		parameters (systolic blood pressure, diastolic blood pressure, heart rate and oxygen saturation).	
Comfort			
Liu et al. (2020)	Children in the Pediatric Intensive Care Unit listened to their own favorite music through headphones for 60 minutes three times a day.	Comfort (COMFORT- B score), physiological outcomes (heart rate, respiratory rate, systolic blood pressure, oxygen saturation, diastolic blood pressure, amount of on-demand midazolam use, ventilation time, and length of stay.	COMFORT-B scores, mechanical ventilation time, physiological outcomes, and on-demand midazolam, all had significant differences before and after the music intervention compared to the control group.
Mateu et al. (2019)	Music listening through headphones of new age Zen style	Pain measured with Ramsay scale and	No significant findings.

	music chosen for its relaxing properties that lasted 60 minutes.	Bispectral Index and BPS.	
Delirium			
Browning et al. (2020)	Patient specific music was played free-field at dosing intervals of 60 minutes twice daily	CAM-ICU and RASS scores were collected every 8 or 12 hours to measure content and level of consciousness to assess delirium.	No significant findings.
Khan et al. (2020)	Patients were randomly selected to either receive personalized music, slow-tempo music, or an audiobook.	Delirum measured with CAM-ICU, daily sedative consumption.	No significant findings.
Narcotic/Sedative Consumption			
Beaulieu-Boire et al. (2013)	Music listening through headphones for one hour of 10 random and	Daily narcotic/sedative drug consumption and vital signs.	No significant findings.

	consecutive pieces of slow-tempo music.		
Dijkstra (2010)	Patients listened to either Classical or easy listening music with headphones for 3 sessions of 30 minutes spread over 3 days.	Physiological parameters (systolic, diastolic and mean Arterial blood pressure and heart and respiratory rate were assessed in both groups at baseline and after five, 10, 20, 30 and 60 minutes) and level of sedation APACHE II-score.	Patients in the experimental group showed significantly Higher sedation scores than patients in the control group after the first session.

Chlan et al. (2013)	Self-initiated patient-directed music (PDM) administered through headphones (patient music preference assessed by music therapist).	Reduce anxiety (VAS-A) and sedative drug exposure (dose and frequency).	PDM patients had significantly lower VAS-A scores than those in the control group. There was a significant interaction between the PDM group and time, which showed a decrease in sedation intensity and sedation frequency over time (per day) for the PDM group only.

Note. Descriptions of the measurement tools can be found in Appendix D.

Music Medicine and Symptom Management of Mechanically Ventilated Patients

Music Medicine and Anxiety. Music listening has potential to reduce anxiety in mechanically ventilated patients as evidenced by desired changes in psychological and physiological parameters (e.g., Park & Park, 2019). Desired physiological changes consistently reported in the research literature include heart rate, respiratory rate, blood pressure, sedation frequency and intensity, and blood cortisol levels (e.g., Chlan et al., 2013; Han, 2010; Korhan, 2011; Lee et al, 2005; Lee, Lai et al., 2017; Lee, Lee et al., 2017; Wu & Chou, 2008). Overall, when music medicine is introduced a decrease in these physiological variables is observed. Table 1 describes the outcomes in full detail.

The effect of music medicine on anxiety was the most common psychological variable studied. Research participants were asked to self-report anxiety pre and post music listening using standardized anxiety measures including the Visual Analogue Scale for Anxiety (VAS-A) (Chlan et al., 2013; Lee, Lai et al., 2017; Park & Park, 2019;), State-Trait Anxiety Inventory (STAI) (Park & Park, 2019), Richmond Agitation Sedation Scale (RASS) (Park & Park, 2019) and the Chinese version of the Stage-Trait Anxiety Inventory (C-STAI) (Han et al., 2008; Lee et al., 2005; Lee, Lai et al., 2017; Lee, Lee et al., 2017). Overall, music listening results in a decrease in standardized anxiety scores. Table 1 describes the outcomes in full detail.

Music Medicine and Weaning. Liang et al. (2016) explored the effect of patient selected music on heart rate, respiratory rate, oxygen saturation, blood pressure, dyspnea, anxiety, and weaning duration (mean hours off ventilator per day on music and non-music days) during mechanical ventilation weaning trials. Dyspnea and anxiety were assessed with the Visual Analog Scale for Dyspnea (VAS-D) and the Visual Analog Scale for Anxiety (VAS-A). Changes in these variables were recorded by the researchers. The music was chosen by the researchers but

was informed by a 13-item questionnaire that assessed patient music preference. Provision of music was alternated over a six day research period, resulting in three music days and three no music days. Data was collected on each day of the six day research period to compare outcomes on music and no music days. Significant decreases in respiratory rate and VAS-D were reported. Additionally, a significant increase in daily weaning duration on music days was reported.

Music Medicine and Pain and Comfort. Music medicine interventions have also been found to influence pain intensity and duration in mechanically ventilated patients. Jacq et al. (2018) assessed the effect of listening to music on pain experienced by patients during their morning bed bath using the Behavioral Pain Scale (BPS). Each participant listened to the same selection of Mozart songs played through headphones. The music started when the bed bath began and continued for 30 minutes after. Their results reported that the presence of music significantly decreased pain intensity and duration. Yaman (2016) evaluated music listening's effect on pain related physiological measures in mechanically ventilated patients. They measured heart rate, oxygen saturation, blood pressure, tidal volume, and respiratory rate and assessed with the Critical-Care Pain Observation Tool (CPOT). While they found no statistical differences in these measures, the researchers still concluded that music medicine can be an effective practice for reducing pain and anxiety.

Similarly, Mateu et al. (2019) assessed the effect of sound isolation versus music on comfort in mechanically ventilated patients by accessing data gathered through using the BPS and Ramsay scale with no statistically significant findings. Patients were randomly selected to receive either sound isolation followed by music, or music followed by sound isolation. The music selection was a new age Zen style of music chosen for its relaxing properties that lasted 60 minutes. They concluded that music intervention is a potential strategy to increase comfort and

reduce pain and that further research should be conducted. Additionally, Liu et al., (2020) assessed comfort behavior before and after music intervention for children in the Pediatric Intensive Care Unit (PICU) receiving mechanical ventilation using the COMFORT-Behavorial (COMFORT-B) scale. The COMFORT-B scale assesses distress through observation of behavior. Liu et al., (2020), provided children with preferred music through headphones for 60 minutes three times a day (morning, noon and night). Data was collected five minutes before and five minutes after music listening. COMFORT-B scores indicated that following music listening, children were more comfortable.

Music Medicine and Delirium. Browning et al. (2020) and Khan et al. (2020), evaluated music listening's effect on delirium. Khan et al. (2020) evaluated the effect of personalized music, slow-tempo music, and audiobooks on delirium using the Confusion Assessment Method for the ICU (CAM-ICU). Patients were randomly selected to either receive personalized music, slow-tempo music, or an audiobook. Music listening was provided for one hour two times a day for seven days. CAM-ICU scores were collected twice daily to assess delirium severity. They found that patients in the music group experienced lower delirium severity and more median delirium/coma-free days. Browning et al. (2020) researched the use of patient specific therapeutic music listening on delirium frequency. Music listening occurred at prescribed dosing intervals of 60 minutes twice daily (10:00am/11:00am or 9:00pm/10:00pm). CAM-ICU and RASS scores were collected every 8 or 12 hours. Their results collected through evaluation of CAM-ICU and RASS scores (Confusion Assessment Method for the ICU, Richmond Agitation-Sedation Scale) suggested that music intervention promotes alertness and calmness while decreasing duration of ICU delirium.

Music Medicine and Patient Music Preference. The incorporation of patient preferred music in music medicine protocols has been studied extensively (Browning et al., 2020; Chlan, 2013; Han, 2010; Khan et al., 2020; Lee et al., 2005; Lee, Lai et al., 2017; Lee, Lee et al., 2017; Liang et al., 2016; Liu et al., 2020; Park & Park, 2019). Although there was no statistically significant difference between the outcomes of the studies which incorporated patient music preference and those that did not, it is generally agreed that patient music preference should be considered for the greatest outcome potential (Costa & Hargreaves, 2018; Michell & MacDonald, 2006).

Economic Benefits

Music Medicine and ICU Cost. The ability for music interventions to reduce anxiety also has economic benefits. Chlan et al. (2018) completed a probabilistic cost-benefits analysis to examine ICU costs for mechanically ventilated patients receiving a patient-directed music intervention compared with patients who received usual ICU care. The probabilistic cost-effectiveness analysis found that average patient-directed music intervention costs were $2,155 less than usual ICU care and projected that cost saving is achieved in 70% of 1,000 iterations. The researchers found that patient directed music intervention reduced VAS-A scores by an average of 19 points and reduced the length of stay and need for sedative medicine when compared to usual care. Liu et al. (2020) reported that mechanically ventilated children in the pediatric intensive care unit (PICU) who received music medicine treatment had shorter ventilation time and length of stay demonstrating the potential for music medicine to reduce ICU cost by shortening the length of stay needed.

Music Medicine and Narcotic and Sedative Consumption. A reduction in anxiety and the need for narcotic medicine was reported by Beaulieu-Boire et al. (2013) when music

listening was introduced. The participants engaged in music listening through headphones for one hour of 10 random and consecutive pieces of slow-tempo music. Daily narcotic and sedative drug consumption and vital signs were measured. The results indicated that narcotic consumption decreased. Chlan et al. (2013) reported a reduction in anxiety and sedation frequency and intensity implying that self-administered preferred music listening through headphones can be a way for patients to manage anxiety without solely relying on medications. Dijkstra (2010) reported higher levels of sedation in patients receiving music listening intervention implying the presence of music can lead to a decrease in the need for sedative medicine. Khan et al. (2020), described above, also reported lower mean doses of benzodiazepines per day in the music listening group. Liu et al. (2020), also described above, reported that children in the control group had higher total amounts of on demand midazolam use implying that the presence of music in the treatment group led to lower amounts of sedative consumption.

Clinical Papers

Several clinical papers describe the use of music medicine to manage physiological and psychological symptoms related to mechanical ventilation. Austin (2010) summarized the literature surrounding the use of music listening in intubated children in the ICU. The conclusions suggest that music listening is a feasible holistic approach to managing symptoms of mechanical ventilation such as anxiety in intubated children. Van Ho et al. (2012) offers an interesting perspective written by baccalaureate nursing students who observed the use of music intervention with clients ventilated in intensive care. They expressed their appreciation for their newfound insight into holistic ways to improve quality of life in the intensive care unit such as the incorporation of music listening. They expressed encouragement for other health care

providers to think holistically when aiming to improve quality of life and consider treatments such as music listening. Improved sleep and feelings of comfort and gratitude were also found to be beneficial thematic outcomes of music intervention. The researchers conducted interviews with patients on mechanical ventilation and their families and analyzed their responses to reveal these themes (Tracy, 2015). The benefits of music intervention with those on mechanical ventilation are apparent in the limited literature.

Chlan and Heiderscheit (2009) described the development of a music assessment tool for determining music preference of patients who were mechanically ventilated. Further, a listening protocol was developed to identify when patients prefer to listen to music, and the reason for music listening. The authors include a case example demonstrating how the assessment may be used in clinical practice. Chlan et al., (2013), used this assessment and listening protocol developed by Chlan and Heiderscheit (2009), to create individualized music playlists for the research participants in their study. This use of this assessment and listening protocol is further explained by Heiderscheit et al. (2011). The music intervention delivered was considered music medicine, but the assessment used to evaluate the patients' music preference was developed by music therapists.

Music Therapy and Mechanical Ventilation

There is only one music therapy study which examines the efficacy of music therapy assessment or methods in the treatment of mechanically ventilated individuals (Hunter et al., 2010). Hunter et al., (2010) described the use of various music therapy methods with mechanically ventilated patients undergoing weaning trails. The music therapist conducted a 30–45-minute session with mechanically ventilated patients during weaning trials where the music therapist applied several music therapy methods. The goal of the music therapy intervention was

to reduce anxiety and facilitate weaning (Hunter et al., 2010). The music therapist encouraged the client to recreate live preferred music and actively participate through singing or playing an instrument. The music therapist engaged the client in instrumental and vocal improvisation and facilitated verbal lyric discussion when the patient was able. The music therapist and client wrote songs and the music therapist implemented receptive music assisted relaxation activities. The music therapist facilitated guided imagery with music and used musical entrainment to lower the heart rate and respiratory rate of the patient (Hunter et al., 2010). The results of the study found significant differences in heart rate and respiratory rate from the beginning to the end of the music therapy sessions, indicating a more relaxed state. It was also reported that patient and nurse satisfaction was high.

Problem Statement

Although the literature is limited, there is evidence that music medicine interventions for those on mechanical ventilation may reduce anxiety evidenced by changes in physiological parameters, and reduce other noxious symptoms related to mechanical ventilation such as weaning, pain, and delirium. Music interventions seem to be economically beneficial due to the decreased need for narcotic sedative medicine. Additionally, the number of hospitalized patients who have been placed on a mechanical ventilator has increased due to COVID-19. While there are many examples of the use of music medicine, music therapy research with this population is very limited. What is missing from the literature is a clear understanding of the music therapy methods used to address the symptoms related to mechanical ventilation. Therefore, the purpose of this study is to gain information about current music therapy methods, to serve as a basis of knowledge for future music therapy practice with those on mechanical ventilation.

Method

To gather data in a quantitative but descriptive way, the researchers conducted a survey. The survey consisted of structured questions with an option to write in an original response. This combination allowed for quantitative analysis of trends when prewritten answers were selected, while also being open to specific feedback from the music therapists when an original answer was written. Being able to articulate and reference data on current trends in popularity when it comes to music therapy goals and methods used with mechanically ventilated patients can inform music therapists and medical professionals on the nature of music therapy practice.

Study Survey

The 33-question survey was developed by the researcher and her thesis chair. Survey items included demographic questions related to age, gender, race/ethnicity level of education, years working as a music therapist, and number of hours with mechanically ventilated individuals. Additionally, there were items related to music therapy practice including goals, music therapy methods, music therapy session type, frequency and duration, and perceived efficacy. Finally, participants were asked to choose which factors informed their choice of music therapy method used, and their perception of efficacy of music therapy with this population formatted as a Likert scale (1-not effective to 5- very effective). The last question was open ended and stated, “Please add any information you would like to share about your work with mechanically ventilated individuals.” The survey was reviewed by two music therapists who have experience working with patients receiving mechanical ventilation. Modifications to the initial survey were made based on this feedback. The final version of the survey included 33 items in 4 categories: 1) demographic information, 2) music therapy practice, 3) influencing factors and 4) perceived effectiveness. The modified survey may be found in Appendix A. The

survey link included consent language, inclusion criteria, and informed participants of the purpose of the study and potential risks and benefits. The survey invitation may be found in Appendix B.

Ethics Review

The research protocol and modified survey were determined to be exempt by the Human Research and Ethics Board (HREB) of the State University of New York at New Paltz (See Appendix C). They survey was then submitted to the American Music Therapy Association along with HREB exempt determination with a request for e-mail addresses of music therapist working in medical settings. The survey was conducted and distributed using the anonymized version of Qualtrics.

Survey Participants

The survey participants were board certified music therapists (MT-BCs) from across the United States that had experience working with mechanically ventilated individuals. An email list of MT-BCs working in medical settings was purchased from the American Music Therapy Association (AMTA) consisting of 326 potential email recipients.

Procedure

The method of data collection for this research study was a web-based survey conducted using the anonymized version of Qualtrics. AMTA members who met the inclusion criteria were sent an e-mail invitation to complete the survey. The e-mail invitation included a brief description of the content of the survey, inclusion criteria, and survey link. The first question of the survey provided an overview of research description, risks, participant rights, confidentiality, and compensation. At the end of question 1, participants were asked to provide consent to participate in the survey by checking appropriate boxes provided. The anonymizing feature in

Qualtrics was used, so no identifiable data was present in the responses. Questions 2-4 outlined the inclusion criteria for the study. If the participant answered no to questions 2-4 they were thanked, and the survey ended (The survey may be found in Appendix A).

Data Analysis

Data collected in this survey were automatically tallied by Qualtrics and reported as percentages representing the number of responses each item received or presented as graphs for analysis.

Results

In total, 326 invitations to participate in this survey were sent out. A total of 36 music therapists responded to the survey for an 11% return rate. Of the 36 who responded seven did not meet inclusion criteria. Twenty-nine or 8% of those responded and met the inclusion criteria. Eighteen or 6% of those responding completed the survey and 11 or 3% of those who started did not complete the survey.

Music Therapist Demographics

The majority of the respondents identified as women (82.8%), and six of the seven geographical regions of the AMTA were represented; there were not any respondents from the New England region (see Table 2). Participants ages ranged from 25 to 60 and 79.3% of the respondents self-identified as White (not Hispanic or Latino) (see Table 2). More than half (58.6%) of the respondents indicated that their primary theoretical orientation was Humanistic (see Table 2). Most of the respondents held master's degrees (62.1%), and all of the master's and bachelor's degrees specified were in music therapy. When asked the number of years they have been practicing music therapy, most of the responses were those between 1-5 years and 6-10 years (65.5%) (see Table 2).

Table 2

Music Therapist Demographics

Question	# of Participants	% of Participants
Gender		
Female	24	83
Male	5	17
Age		
25-30	10	35
31-35	10	35
36-40	3	10
41-45	1	3
51-55	1	3
Ethnicity		
White	23	79
Asian	3	10
Hispanic	2	7
African American	1	3
AMTA Region		
Great Lakes	9	31
Southeastern	6	21
Mid-Atlantic	5	17
Southwestern	4	14
Midwestern	3	10

Western	2	7
Theoretical Orientation		
Humanistic	17	59
Cognitive Behavioral	3	10
Psychodynamic	2	7
Neurologic	2	7
Music centered	1	3
Other	4	14
Level of Education		
Master's degree	18	62
Bachelor's degree	11	38
Years Experience as a Music Therapist		
1-5 years	9	31
6-10 years	10	35
11-15 years	4	14
16-20 years	2	7
26-30 years	1	3
30+ years	3	10

Clinical Practice with Mechanically Ventilated Patients

Respondents noted they worked between 1-3 hours (n=11, 37.9%) or 10 + hours per week (n=7, 24.1%) with mechanically ventilated patients (see Table 3). They reported the average length of stay for patients treated was at least one month or longer (n=14, 70%) (see Table 4). The most common reason for referral reported was anxiety reduction (75%), with the

least common being emotional expression (35%) (see Table 4). Other reasons specified for referral to music therapy were stimulation, previous relationship with music therapist, family support, and fostering development. Working with mechanically ventilated individuals at all levels of alertness was reported consistently by all respondents (see Table 4). The average number of mechanically ventilated patients treated changed minimally before and after the COVID-19 pandemic based on the responses. Almost half of the respondents (n=9 or 47.4%) indicated they did not work with any patients diagnosed with COVID-19 (Table 3).

Table 3

Music Therapist's Clinical Practice

# of Hours per Day Respondents reported working with Mechanically Ventilated Patients (n=29)		
	# of Participants	% of Participants
1-3 Hours	11	38
4-5 Hours	5	17
6-7 Hours	2	7
8-10 Hours	4	14
10+ Hours	7	24
COVID-19 Patients Receiving Music Therapy in the Last 3 Months (n=19)		
	# of Participants	% of Participants
0	9	47
1-3	5	26
4-6	3	16
10-12	1	5
13-15	1	5

Table 4

Patients Receiving Music Therapy

Average Length of Stay (n=20)		
	# of Patients	% of Patients
1-7 Days	2	10
8-13 Days	2	10
14-28 Days	2	10
1 month	3	15
2-3 months	4	20
4-5 months	2	10
6 months or longer	5	25
Reason for Referral (n=20)		
	# of Patients	% of Patients
Anxiety	15	75
Pain	14	70
Quality of Life	13	65
End of Life Care	13	65
Promote Weaning	11	55
Influence Physiological Measures	10	50
Cope with Hospitalization	9	45
Emotional Expression	7	35
Other	5	25
Patient Level of Alertness During Music Therapy Sessions (n=20)		
	# of Patients	% of Patients
Alert	17	85

Verbal	16	80
Pain	17	85
Unresponsive	17	85

The methods for determining patient music preference were identified and all of the respondents reported they use knowledge from the patients' family. Of the respondents, 79% reported the use of knowledge from the patient themselves, and 37% of the respondents reported the use of knowledge from medical staff. Other methods specified by the respondents to determine patient music preference were the observation of the patients' behavior (nonverbal, vital signs, facial expressions) during live music, facility admission notes, and knowledge of popular music during the time when the patient was an adolescent. Most of the music therapists (73.7%), reported they did not use standardized non-music assessment tools. The mode of mechanical ventilation was mostly invasive (84.2%) for the patients treated by music therapists. The majority of music therapists reported working with patients during mechanical ventilation weaning trials (n=13 or 68.4).

Music Therapy Session Format

Music therapists were asked to provide details regarding the format of their music therapy sessions. Most respondents reported that they provided individual sessions (n=15 or 78.9%) while the remaining 21.1% (n=4) reported that they provided both individual and group sessions. Group music therapy sessions usually included 1-3 patients (n=6 or 83.3%), though one music therapist reported a group size of 4-5 patients. The average duration of the music therapy sessions was identified to be between 15-30 minutes (42.1%), followed by 30-45 minutes (31.6%), 45-60 minutes (15.8%), and less than 15 minutes (5.3%). One respondent noted that their session duration can range from 15 to over 60 minutes. The average frequency of music therapy sessions per week was indicated to be between 2-3 times a week by 63.2% of the

respondents, with once a week being most of the remaining responses (31.6%). Around half (52.6%) of the respondents indicated that they see their patients for more than six sessions before discharge from music therapy.

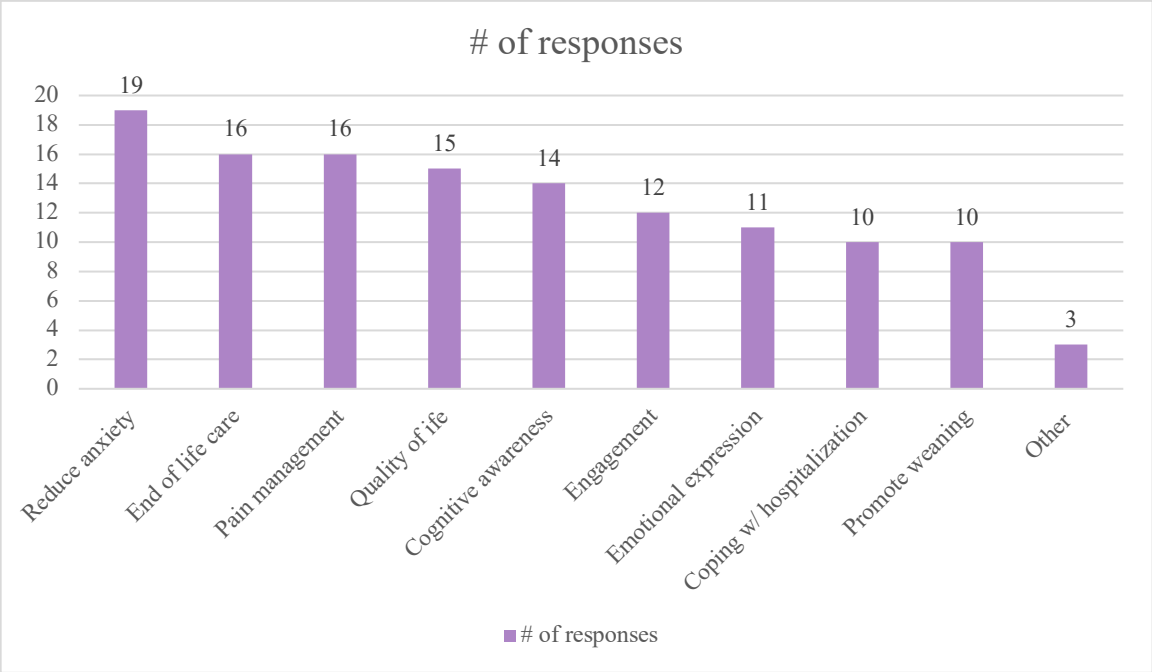
Music Therapy Treatment

Music Therapy Goals

The participants were presented with a list of nine goals that were identified in the literature review or through talking with experts as being commonly addressed in music therapy sessions with patients who are mechanically ventilated. Participants were instructed to select all that applied to their clinical practice. There was also an opportunity for music therapists to type their own response if they chose *Other (please specify).* Figure 1 illustrates the popularity if each goal area addressed with mechanically ventilated patients shown by the number of responses each goal area received (n=20). Anxiety reduction was the most popular treatment goal identified by respondents (n=19; 95%). Eighty-four percent (n=16) of respondents indicated they addressed goals related to end of life care (n=16) and pain management (n=16). Other goals specified in the comments were to foster development (n=1), normalize the environment (n=1), and provide musical spiritual support for the patient and family during the end of life (n=1).

Figure 1

Music Therapy Goals Commonly Addressed with Mechanically Ventilated Individuals (n=20)

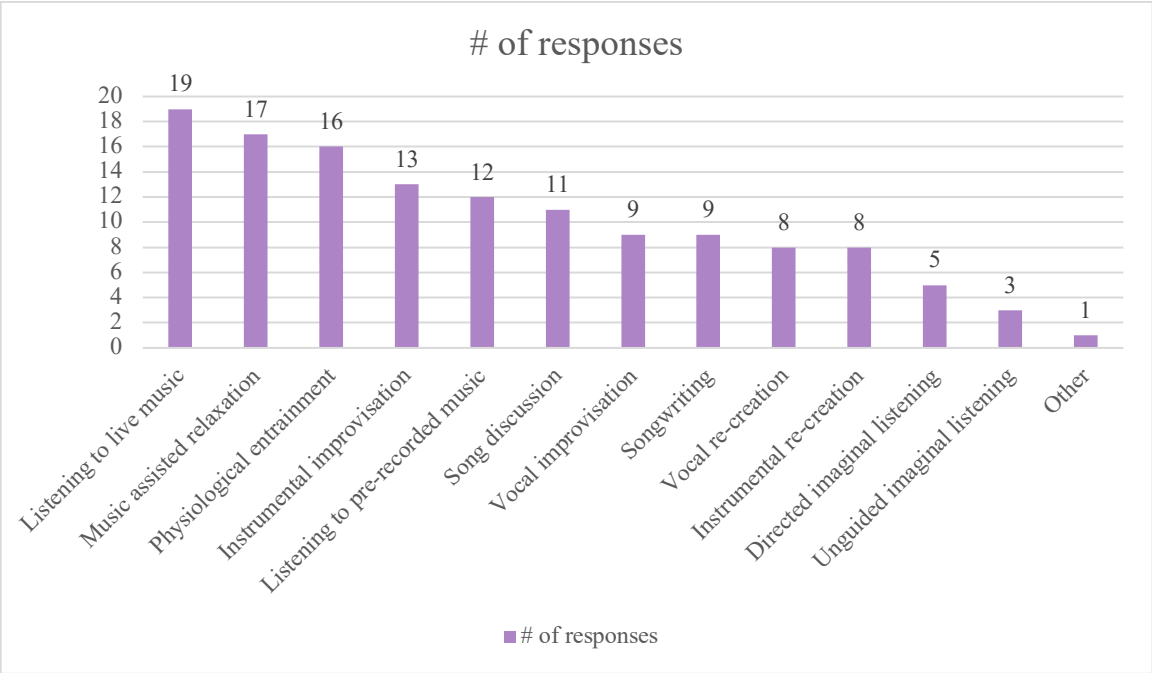


Music Therapy Methods

Respondents identified the music therapy methods they utilize when working with mechanically ventilated individuals (n=20). Figure 2 illustrates the distribution of the popularity of each method utilized (n=20). 95% (n=19) of respondents reported that they use listening to live music during their music therapy sessions. The second most popular method was music assisted relaxation (89%; n= 17) followed by the use of physiological entrainment (84%; n=16). One respondent noted they use verbal processing with the family.

Figure 2

Music Therapy Methods Commonly Utilized with Mechanically Ventilated Individuals (n=20)



Music therapists were also asked to report which music therapy methods they used to address certain goal areas. The number of responses for each goal area varies, so the data is based on a different *n* value for each goal. Music therapy methods used for specific goal areas are reported in Figures 3-11. Anxiety reduction had the greatest number of responses (n=16) and the most common music therapy method used was music assisted relaxation (94%) followed by listening to live music (88%) (Figure 3). Listening to live music was the most common music therapy method used when addressing pain management (n=14, 86%) (Figure 5), improving quality of life (n=14, 86%) (Figure 6) and cognitive awareness (n=12, 83%) (Figure 9).

Figure 3

Music Therapy Methods Commonly Used to Address Anxiety (n=16)

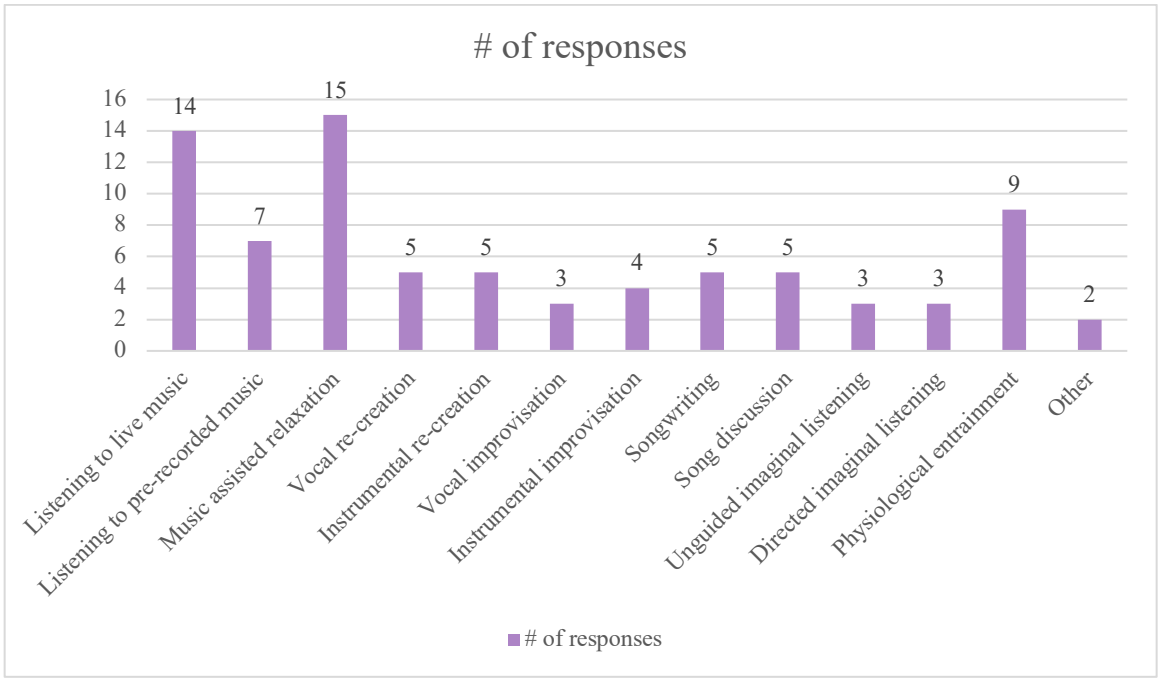


Figure 4

Music Therapy Methods Commonly Used to Address End of Life Care (n=14)

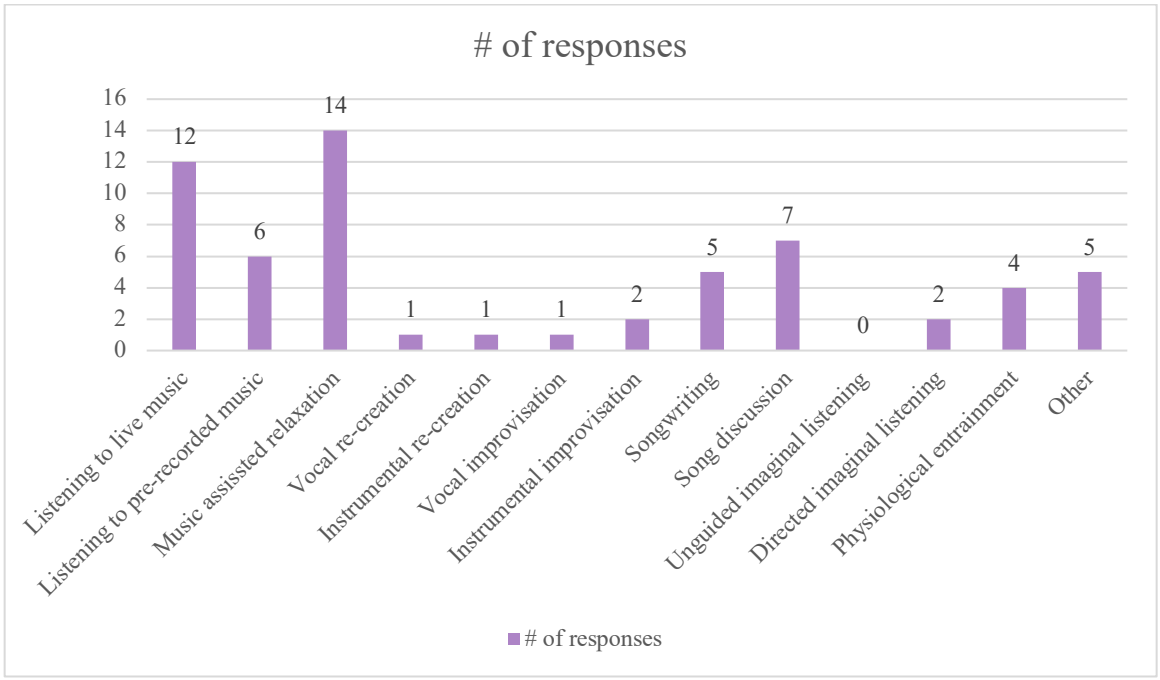


Figure 5

Music Therapy Methods Commonly Used to Address Pain Management (n=14)

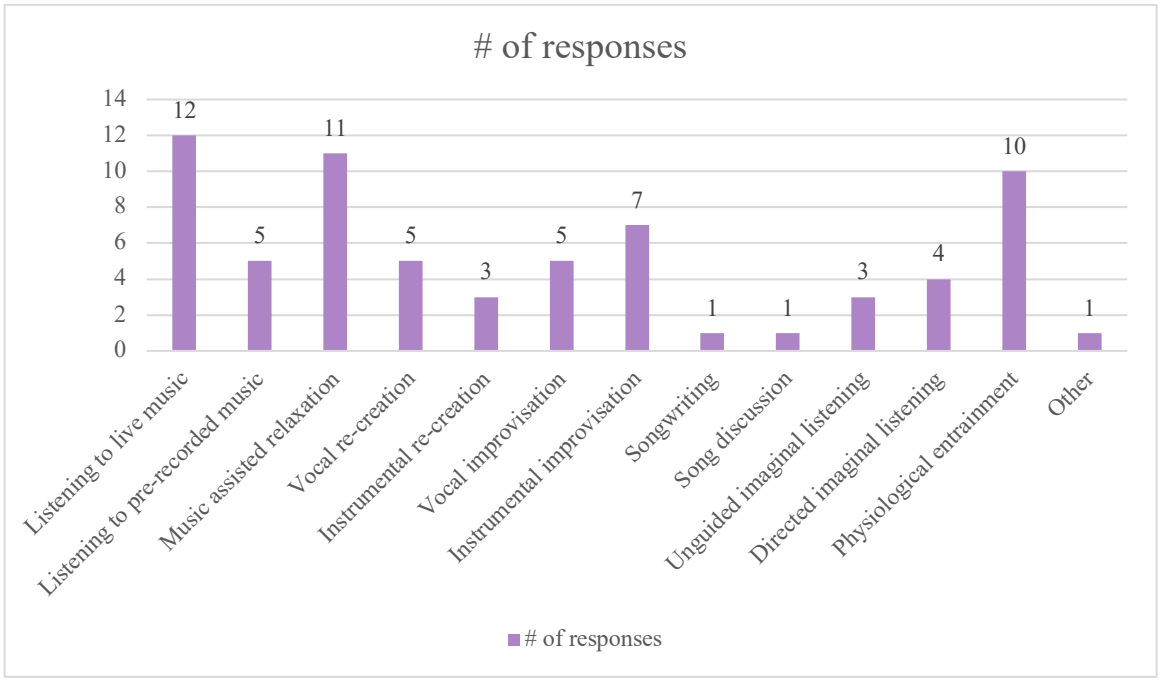


Figure 6

Music Therapy Methods Commonly Used to Address Quality of Life (n=14)

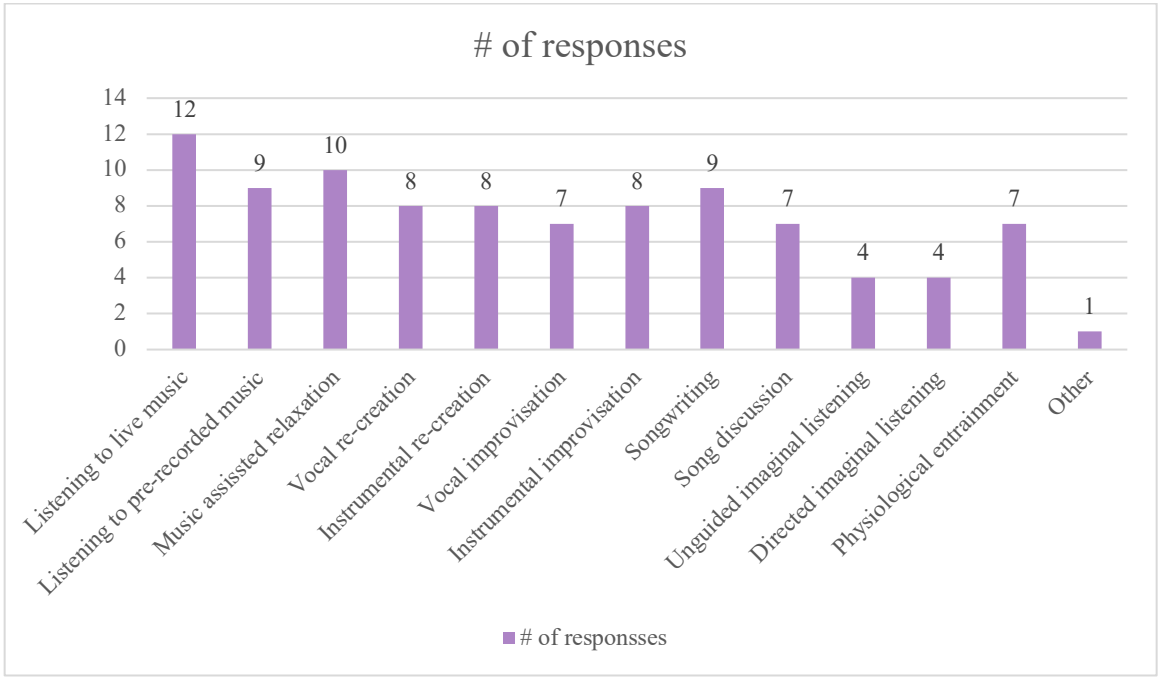


Figure 7

Music Therapy Methods Commonly Used to Promote Weaning (n=13)

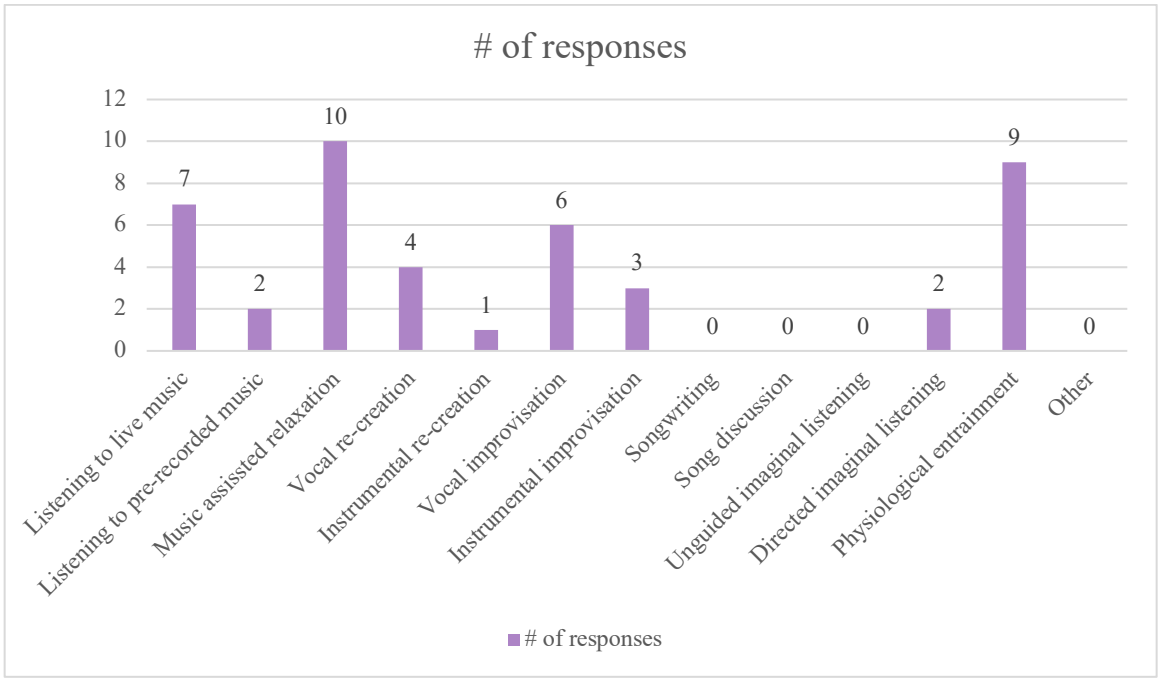


Figure 8

Music Therapy Methods Commonly Used to Address Engagement (n=12)

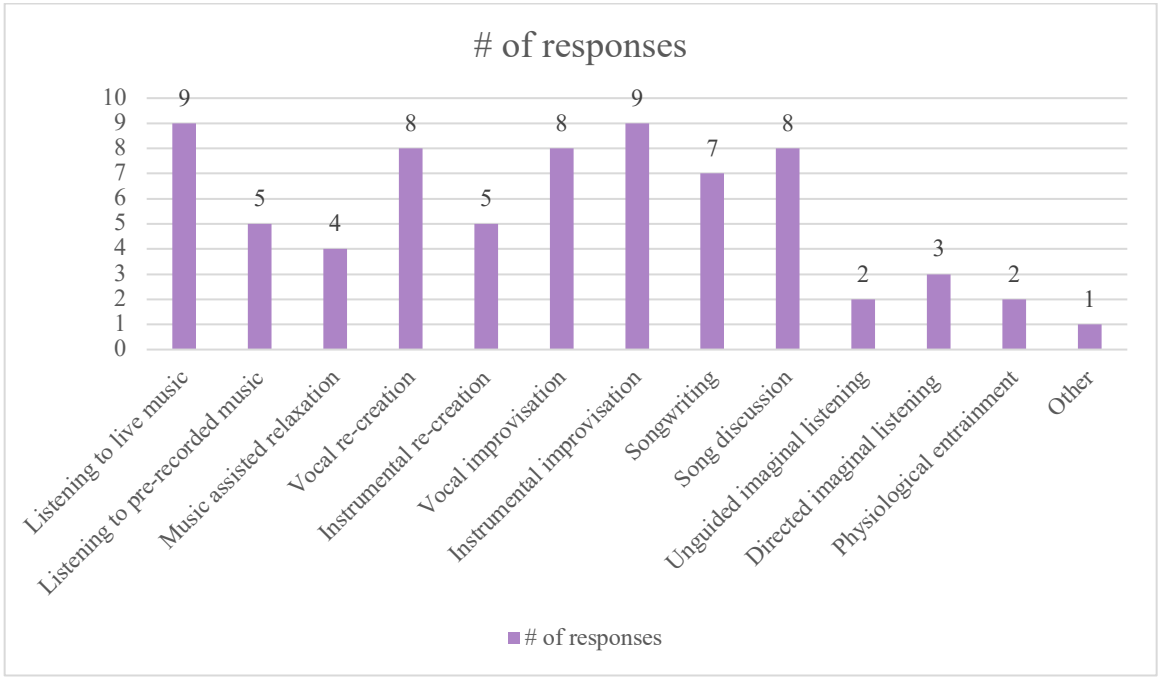


Figure 9

Music Therapy Methods Commonly Used to Address Cognitive Awareness (n=12)

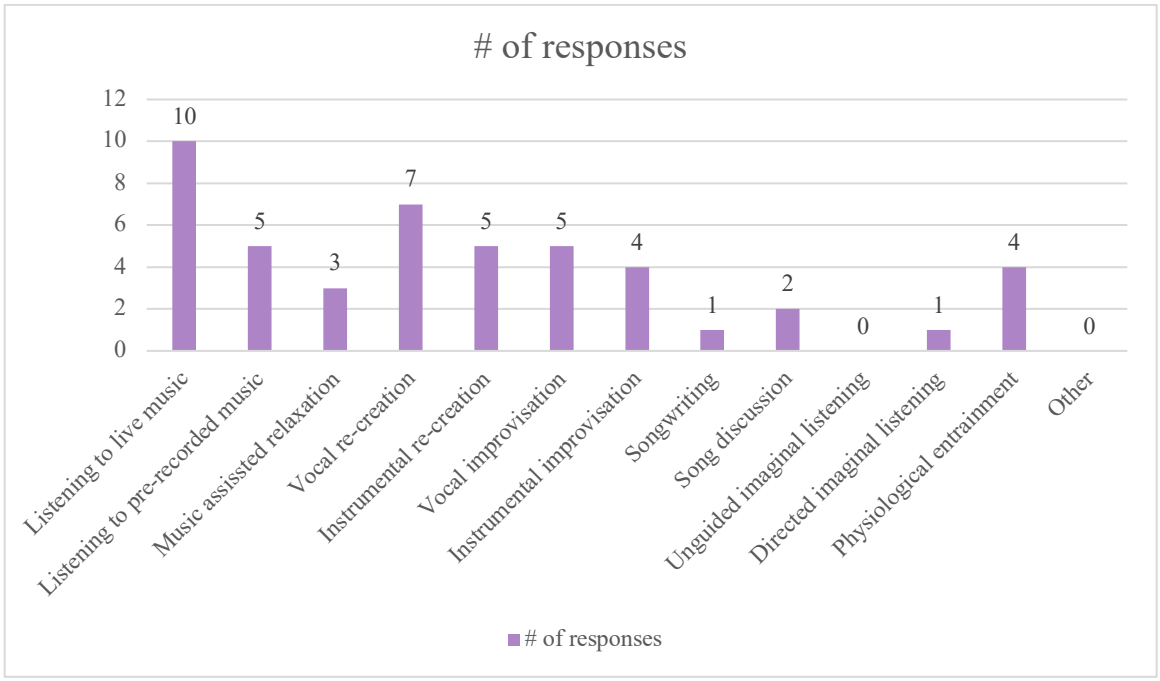


Figure 10

Music Therapy Methods Commonly Used to Address Emotional Expression (n=11)

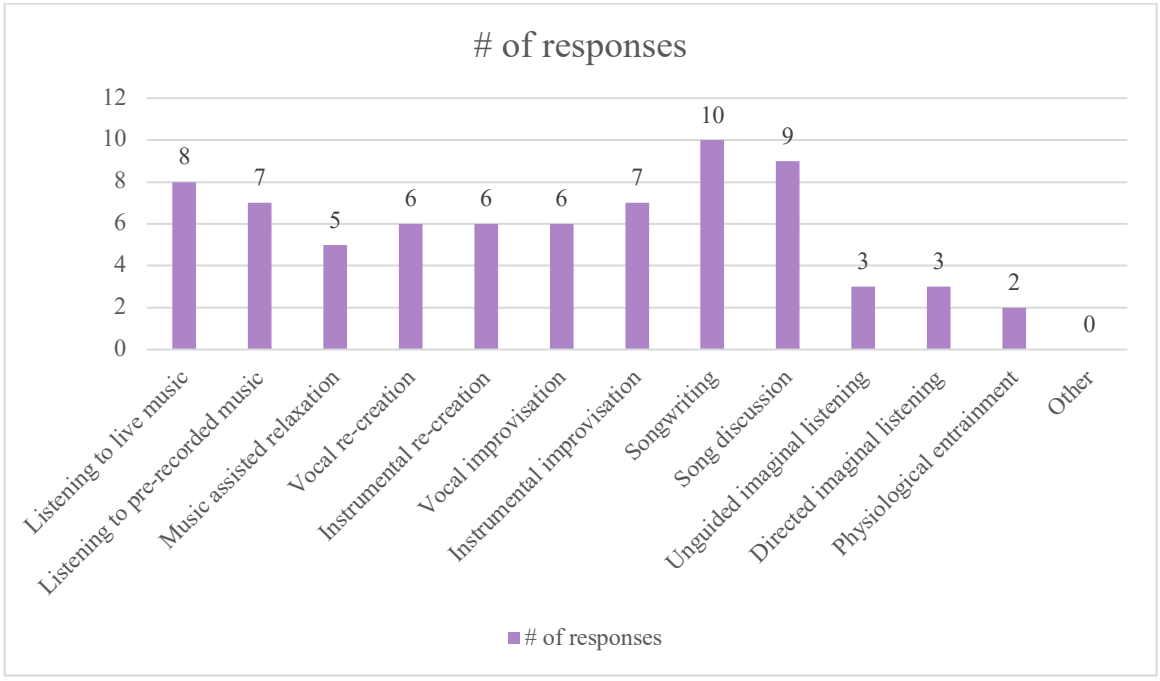
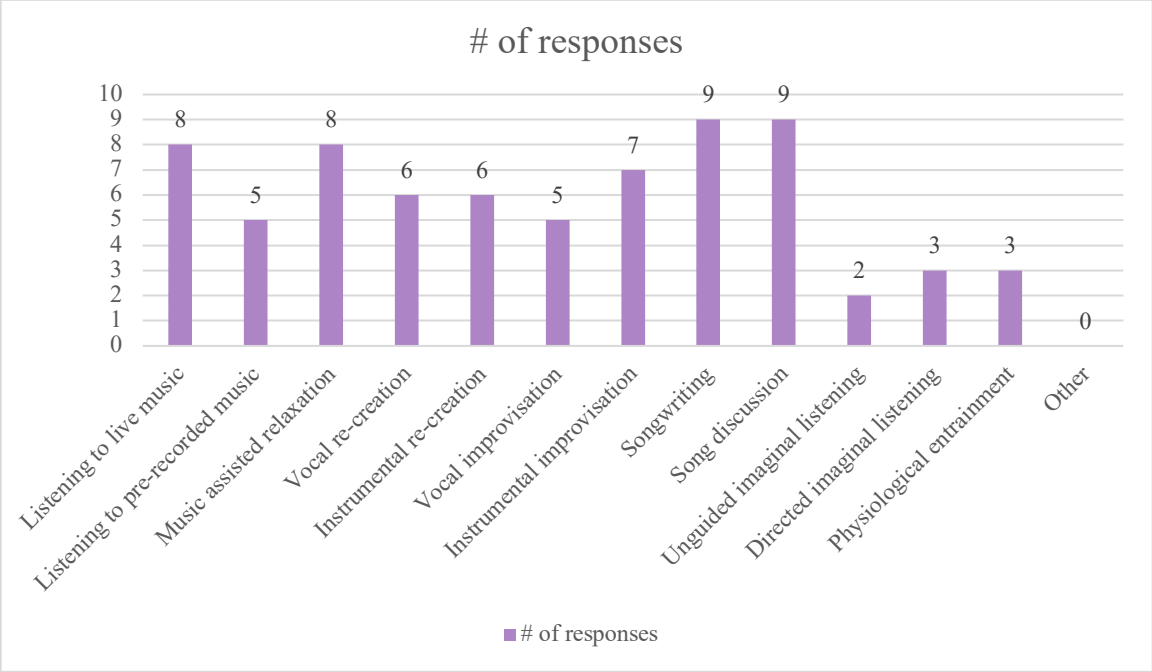


Figure 11

Music Therapy Methods Commonly Used to Address Coping w/ Hospitalization (n=9)



Influencing Factors and Perceived Effectiveness of Music Therapy

The factors that influence music therapists' choice of music therapy method to use were collected. Respondents were asked to check all the factors that applied to their clinical practice. There was also an opportunity for music therapists to type their own response if they chose *Other (please specify).* Figure 12 shows the distribution of each potential influencing factor for music therapy method selection (n=18). Ninety-five percent (n=17) of music therapists indicated that assessment of the patient in the moment influenced their choice of music therapy method. The preferences of the patient and the initial reason for referral to music therapy was also chosen by 89% of the therapists. One music therapist specified that they use the developmental age of the client to inform their choice of music therapy method.

Respondents were asked to rate their perceived effectiveness of music therapy to address treatment goals using a Likert scale where1 represented *not effective*, 3 represented *somewhat*

effective, and 5 represented *very effective* (n=18). Half of the respondents chose scale point 4, with 33% rating their perceived effectiveness of music therapy to be *very effective.* The remaining 17% of respondents rated their perceived effectiveness of music therapy to be *somewhat effective* (Figure 13). Participants were asked to identify the factors that influenced their perceived effectiveness of music therapy with mechanically ventilated patients from a list of six options along with the opportunity to add their own response (n=18) (Figure 14). The response from the patient and family was chosen by 95% of the music therapists as the factor that influenced their perceived effectiveness of music therapy. The human connection made through the therapeutic rapport built through music was the second most common choice with a 89% response rate. Two music therapists specified that they use observed physiological changes of the patient (heart rate, respiratory rate, and blood pressure) to determine their effectiveness of music therapy.

Figure 12

Influencing Factors for Music Therapy Method Chosen (n=18)

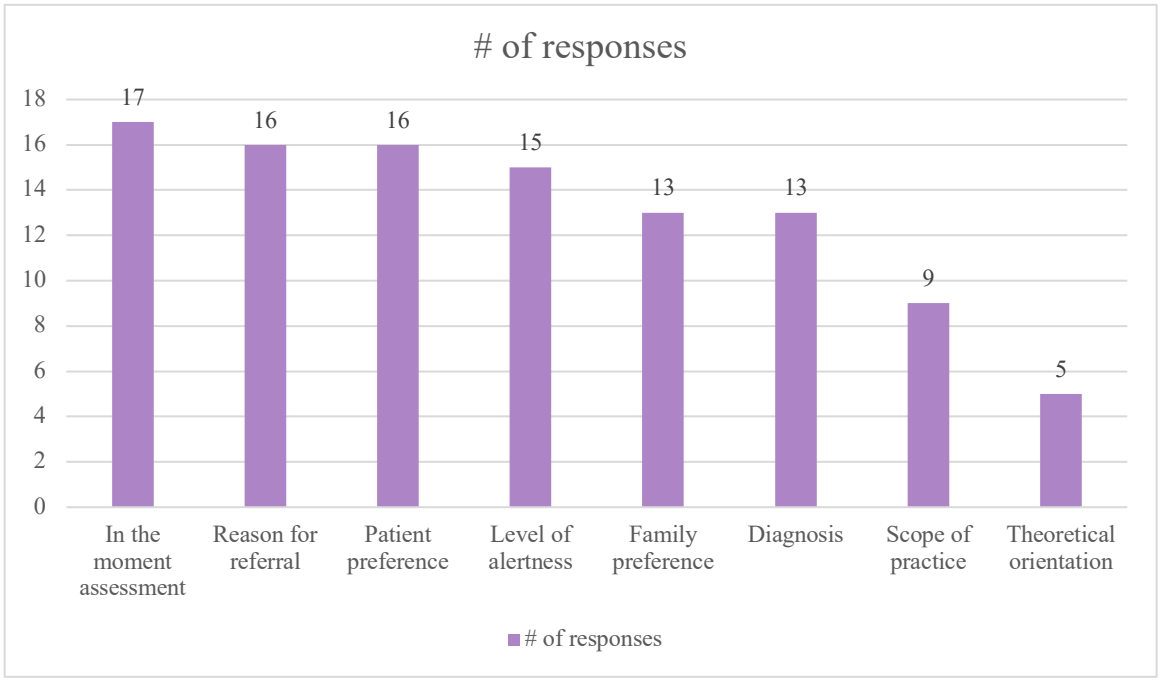


Figure 13

Likert Rating of Perceived Effectiveness of Music Therapy (n=18)

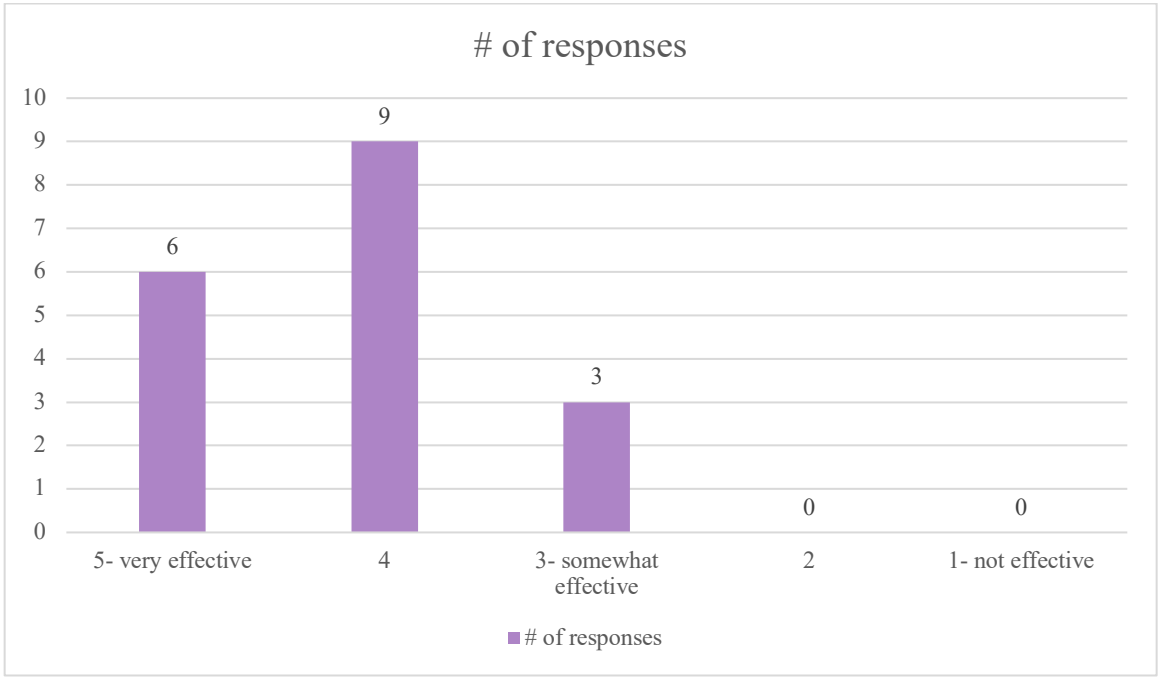
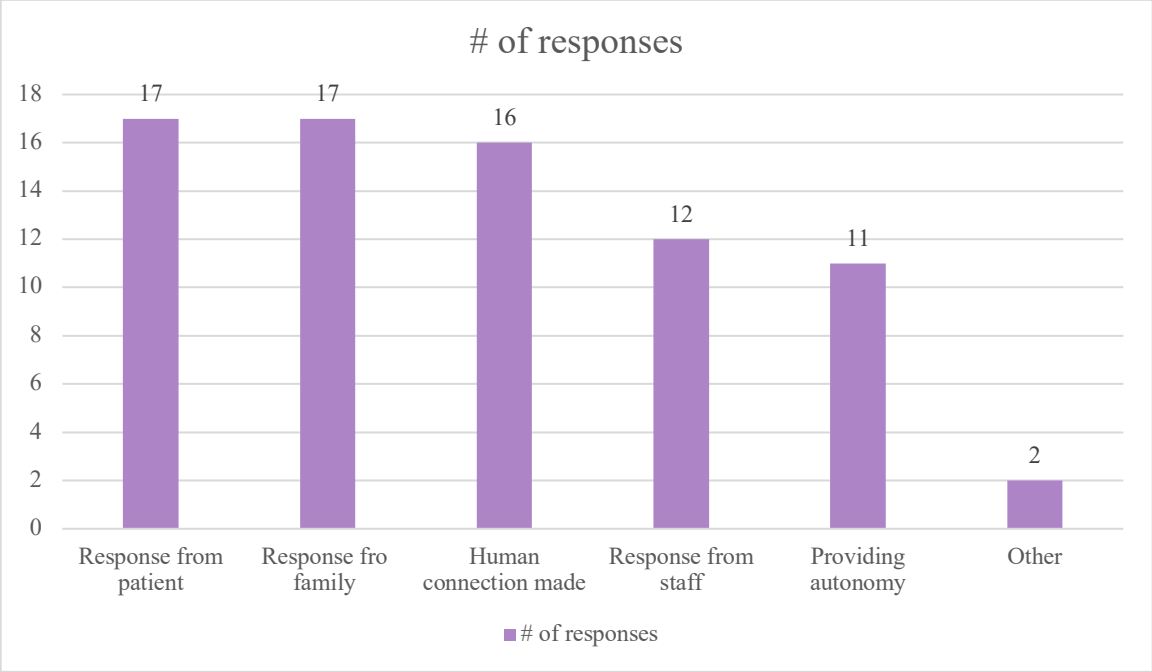


Figure 14

Influencing Factors for Likert Rating of Perceived Effectiveness of Music Therapy (n=18)



Comments about Clinical Work

The final question of the survey was open ended and asked participants to state anything else they would like to share about their clinical work with mechanically ventilated patients. Four music therapists responded with insights into their clinical work.

> *"I work in an acute medical setting so my ability to work with ventilated pts is largely determined by current census size. The two most common types of ventilated pts I work with are pts that have been intubated and then transitioned to a trach or pt's that are intubated and at end of life."*
>
> *"My work is focused around providing decreased anxiety and agitation immediately prior to compassionate extubation from the vent. Majority of the time my patient is extubated and die within hours to days."*

"I am currently conducting a study that is in the data collection phase evaluating music therapy during pediatric extubation readiness trials, and we are seeing that music therapy generously helps in reducing sedatives, gathering better results with SBS, and helping staff to better understand the benefits of music therapy. It is also one of the only experiences and interventions that can be used when patients are sedated or chemically paralyzed; staff notice this and ask for it, especially as it can help not only the patients but whoever is in the room with them (parent, caregiver, sibling, etc.). We have found success in using a ThinkLabs stethoscope connected to a bluetooth speaker and placing it over the patient's chest as to hear their heartbeat, and then we utilize this as the 'rhythm' of the recreative or improvisational experience."

"Most of my work with mechanically ventilated individuals happens within the context of a level IV neonatal intensive care unit. Some of the answers may be skewed by having to choose an option from the provided list that was closest to what my work actually looks like with these infants and their families."

Discussion

Board-certified music therapists working with mechanically ventilated individuals were surveyed to gain an understanding of current music therapy practice with clinical population. Literature describing the use of music therapy with these individuals is limited. However, there is a substantial body of music medicine research that supports the use of music listening with mechanically ventilated individuals, thus making music therapy relevant to this population. The descriptive data collected in the survey responses demonstrates current trends in music therapy practice with mechanically ventilated individuals. The data can serve as a basis of knowledge for

music therapists and medical professionals considering music therapy for mechanically ventilated individuals.

Music Therapy Clinical Practice

The humanistic theoretical orientation in music therapy, also known as patient-centered music therapy, is an approach that discovers and capitalizes on the strengths and resources available to the client to achieve therapeutic goals (Dimaio, 2010). This approach is especially relevant in the medical setting as there are often perceived to be limited inherent resources available to the client due to their medical diagnosis. Humanistic music therapy instead engages the client in their own health. The music therapists surveyed seem to agree with its relevance to medical music therapy and music therapy with mechanically ventilated patients since humanistic music therapy was the most popular theoretical orientation chosen. Knowledge of the theoretical orientation often used by music therapists in medical settings can aid in understanding the nature of medical music therapy practice.

Assessment Practices

Music medicine studies primarily employ the use of a written questionnaire to determine patient music preference (Lee et al, 2005; Lee, Lai et al., 2017; Lee, Lee et al., 2017). However, music therapists surveyed indicated that they primarily use information from the family to gather information on patient music preference and do not use standardized non-music assessment tools. Other methods used to determine music reported by respondents included observation of the patients' behavior (nonverbal, vital signs, facial expression), facility admission notes, and knowledge of popular music during the time when the patient was an adolescent. Choosing music from adolescence is especially relevant because individuals develop their sense of identity during adolescence and musical identity is formed during this time (North & Hargreaves, 1999).

Most of the time mechanically ventilated patients are non-verbal due to the invasive nature of mechanical ventilation (Tate et al., 2012). Music therapists indicated that the majority of their patients had invasive mechanical ventilation. This makes observation of the patients' behavior especially relevant when determining music preference. Additionally, employing the use of facility admission notes and historical knowledge of music are other ways to assess music preference when patients are non-verbal or unable to communicate.

Music Therapy Session Format

Consistent with the music medicine listening interventions, music therapists indicated they worked with patients individually, and the sessions primarily lasted either 15-30 or 30-45 minutes. This is consistent with medical music therapy in the ICU where often sessions are provided individually. Music therapists would see their patients an average of 2-3 times per week or once per week, with six or more sessions occurring before discharge. Music therapists can use this information to plan sessions in this nature when working with mechanically ventilated patients. Additionally, the music therapy methods and goals chosen should be considered in the context of the expected length of treatment before discharge. For example, songwriting often takes many sessions to complete, requiring a prolonged treatment time. Other interventions such as music listening can achieve anxiety reduction in only one session, not requiring prolonged treatment (Crawford et al., 2013; Yates & Silverman, 2015). This consideration ensures that music therapy addresses goals and creates change in mechanically ventilated patients in both the short and long term.

Music Therapy Treatment

Patients are referred to music therapy primarily to address anxiety reduction, as reported by the responses. This correlates with current literature that states that anxiety is a common

symptom experienced by mechanically ventilated individuals that can negatively affect other aspects of their health and healing (Tate et al., 2012). Often, it was reported that the length of stay of the patients treated exceeded one month. Client diagnosis was not included in the questions provided, but it would be an interesting consideration for future research to see how diagnosis and length of stay correlate. It is common for mechanical ventilation to become prolonged, due to the complexities involved in successfully weaning (Tate et al., 2012). Music therapists working with mechanically ventilated individuals should be aware of these common factors to inform their session planning.

Music Therapy and Weaning Trials

The majority of respondents also indicated they provide music therapy with patients during mechanical ventilation weaning trials. This suggests there is a benefit during weaning. The use of music therapy during weaning is under-researched as there has only been one study examining music therapy during weaning trials (Hunter, 2010). In this research study the music therapist researched the use of re-creative music therapy where clients were encouraged to sing or play along. Clients also listened to live preferred music. The lyrics of the songs were discussed when clients were able and some clients also engaged in songwriting (Hunter et al., 2010). The results of this study were favorable for the incorporation of music therapy during weaning and a reduction in heart and respiratory rate was observed. This indicated a more relaxed state and decrease in anxiety following music therapy.

Treatment Goals

The most common goal and reason for referral in music therapy reported was anxiety reduction. This is consistent with existing music medicine and music therapy literature where the most common goal addressed was anxiety reduction with mechanically ventilated patients (e.g.,

Chlan et al., 2013; Han, 2010; Han et al., 2008). Other common goals addressed in music therapy were end of life care and pain management. Current medical music therapy literature supports the use of music therapy to address these goal areas mentioned with patients in a medical setting (Bradt & Dileo, 2014b; West & Silverman, 2020).

Music Therapy Methods

Music therapists reported that the most common music therapy method used to address anxiety reduction was listening to live music. This is consistent with the current music medicine literature with mechanically ventilated patients where music listening is used in every music medicine study mentioned that addresses anxiety. Music assisted relaxation and listening to live music was utilized in the music therapy study with mechanically ventilated patients, further demonstrating its relevance to music therapy practice with this population to reduce anxiety (Hunter et al., 2010). However, the present data also demonstrates that listening to live music can address a variety of goal areas evidenced by it being the most common music therapy method used when addressing end of life care, pain management, improving quality of life, and cognitive awareness. Receptive music therapy such as listening to live music provides both an emotional and physical basis for interpreting and being in life, allowing it to be applied to a variety of clinical goals (Bruscia, 2014). Physiological entrainment was also reported as a common music therapy method utilized in multiple goal areas such as anxiety reduction, pain management, and to promote weaning. The use of physiological entrainment is a common method used in music therapy which utilizes synchronicity between the musical and physiological rhythms provided by the patient such as heart rate and respiratory rate to promote change. The music therapist adjusts the volume and tempo of the music played to the patients' reparations or heart rate, to facilitate a relaxation response (Hunter et al., 2010). Music therapists are able to use music therapy methods

such as listening to live music and physiological entrainment to address a variety of goal areas other than anxiety reduction giving mechanically ventilated patients the opportunity to heal in many ways.

COVID-19 Implications

There has been an increase in number if individuals needing mechanical ventilation due to the recent COVID-19 pandemic (Wunsch, 2020). Therefore, understanding how music therapists engage mechanically ventilated individuals in treatment seems timely. Around half of the music therapists surveyed reported they worked with either 1-4 or 4-6 mechanically ventilated patients with COVID-19 in the last three months, and the other half reported they did not work with any COVID-19 patients in the past three months. Although some music therapists worked with COVID-19 patients, they did not work with that many, and some worked with none. This is interesting in that it does not mirror the current literature that states mechanical ventilation is common during COVID-19 treatment (Wunsch, 2020). There was not a large prevalence of COVID-19 patients treated with the music therapists surveyed. Additionally, the data collected in this survey did not demonstrate a change in the number of mechanically ventilated patients' music therapists were treating before and presently during the COVID-19 pandemic. This is inconsistent with the current literature that states that due to the COVID-19 pandemic, the number of patients needing mechanical ventilation has increased (Wunsch, 2020). Although COVID-19 has increased the number of patients needing mechanical ventilation, the number of mechanically ventilated patients the music therapists in this survey treated did not. Music therapy is not considered an essential therapy for COVID-19 treatment and coupled with the safety precautions implicated and move to telehealth, this low prevalence of COVID-19 patients and lack of change in case load can be understood (Agres, 2021).

Influencing Factors and Perceived Effectiveness of Music Therapy

Most music therapists indicated that assessment of the patient in the moment influenced their choice of music therapy method. This makes sense considering the limited communication available to some mechanically ventilated patients where much of the communication is non-verbal, and behavioral and physiological observation becomes salient to determine physical and psychological health. When asked about their perceived effectiveness with this population, most music therapists rated their perceived effectiveness to be scale point 4 or higher based on a Likert scale where1 represented *not effective*, 3 represented *somewhat effective,* and 5 represented *very effective*. The main reason for this high rating as indicated by the music therapists was the response from the patient and family members. This implies that there was a positive response to music therapy from the patient and family members, making the music therapist feel confident in their effectiveness in treatment. This positive response supports the use of music therapy with this population. The human connection made through the therapeutic rapport built through music followed close behind in popularity for reasons for perceived effectiveness. This suggests that the connection between the client and therapist in the context of music therapy is very apparent and powerful phenomena felt by music therapists. It is so apparent that it impacts how music therapists perceive the effectiveness of their work. This coupled with the high ratings of effectiveness reported suggests that the connection must be a strong and positive one, for it to be a primary reason for a high rating of effectiveness reported. This demonstrates the ability of music therapy to provide an avenue of human connection with mechanically ventilated clients and provide effective change. The individualization and therapeutic process involved in music therapy aims to create this avenue of human connection to foster therapeutic change (Bradt & Dileo, 2014a). Finding ways to connect with mechanically ventilated patients in order to

positively impact their health is stressed in current nursing standards of care where nonpharmacological interventions such as the promotion of a presence (Tracy and Chlan, 2011).

Comments about Clinical Work

The comments music therapists made when reflecting on their work with mechanically ventilated patients centered primarily around the nature and context of mechanical ventilation for their clients. Music therapists indicated that worked with individuals who were previously ventilated but invasively but now are using a tracheotomy, during pediatric weaning trials, in neonative intensive care, patients ventilated at end of life, and following compassionate extubation. Additionally, one music therapist noted that they are currently conducting research on the effect of music therapy during weaning trials and has observed a reduction in the need for sedative consumption. The music medicine literature surrounding music listening's effect on sedative consumption supports this claim, where there is also an observed reduction in sedative consumption during music listening (Beaulieu-Boire et al., 2013). An important note made by this writer was that music therapy is the only treatment feasible when a patient is sedated or chemically paralyzed, demonstrating that music therapy can be implemented at all levels of alertness. The same writer also stressed how music therapy helps not only the patient, but the family or staff members who might be present as well. This global effect of music therapy is felt, and the writer shared that requests for music therapy by the staff have increased. Finally, the use of physiological entrainment was also mentioned where the music therapist used the patient's heart rate as the rhythm for musical improvisation and re-creation. This is consistent with the existing music therapy study of patients weaning from mechanical ventilation where they also employed physiological entrainment (Hunter, 2010). These testimonies provided by the music therapists are supported by existing literature and research on the effects of music intervention

and music therapy with mechanically ventilated individuals, demonstrating consistency in practice and results.

Limitations

The main limitation of this study is the low return rate with only 36 respondents out of 326 possible respondents. Only 18 respondents finished the entire survey and two emails were returned in error when the reminder email was sent. This could be attributed to survey fatigue in that lots of students are sending surveys this time of year for their thesis projects. The length of the survey being 33 items could have also contributed to the survey fatigue and lack of respondents finishing completely. Additionally, some of the questions had unclear language, making them susceptible to being understood differently. These factors could lead to inconsistencies in the results and bias due to low response number.

Future Research

Current music medicine research supports the use of music to alleviate medical symptoms in general and those related to mechanical ventilation. Medical music therapy is a growing field, with limited information about work with mechanically ventilated patients. Future research should focus on collecting descriptive and statistical data about music therapy with mechanically ventilated individuals with special consideration of the music therapy methods used and goals addressed. This will allow for music therapists and medical professionals to gain a clear understanding of the nature of music therapy with mechanically ventilated individuals, and how it effects their health. This research will continue to add to the variety of patients represented in medical music therapy literature, paving the way for advocacy for future medical music therapy services.

Conclusion

Music listening has potential to benefit patients who are mechanically ventilated due to its ability to reduce symptoms associated with mechanical ventilation. Current music medicine and music therapy research demonstrate and support this potential benefit of music listening as a means of non-pharmacological intervention to treat symptoms of mechanical ventilation. Music therapists can meet the physiological, emotional, and social needs of individuals who are mechanically ventilated. This study provides music therapists and other medical professionals with an overview of how music medicine and music therapy is used with mechanically ventilated individuals.

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Appendix A: Survey Questions

Inclusion Criteria

1. Do you meet the following inclusion criteria: you 1) are a Board-Certified Music Therapist, 2) work within the United States, 3) work with mechanically ventilated individuals, and 4) can read and write English?
    - Yes
    - No (if the respondent answers no, they will be thanked, and the survey will end)
2. Do you understand your participation is voluntary and you will not be renumerated?
    - Yes
    - No (if the respondent answers no, they will be thanked, and the survey will end)
3. Do you understand you can end this survey at any time?
    - Yes
    - No (if the respondent answers no, they will be thanked, and the survey will end)

Demographics

4. What is your age?
    - 18-24
    - 25-30
    - 31-35
    - 36-40
    - 41-45
    - 46-50
    - 51-55

- 56-60
- 61-65
- 66-70
- Over 70

5. What is your gender identity?

- Female
- Male
- Transgender
- Gender Non-binary
- I prefer not to say

6. What is your ethnicity?

- White (not Hispanic or Latino)
- Hispanic or Latino
- Black or African American (not Hispanic or Latino)
- Asian or Asian American
- Asian- Pacific islander
- Other
- I prefer not to say

7. In what geographical region of the American Music Therapy Association (AMTA) do you practice?

- Great Lakes
- Midwestern
- Southeastern

- Western
- Mid-Atlantic
- Southwestern
- New England

8. What is your primary theoretical orientation?
    - Behavioral
    - Cognitive-behavioral
    - Humanistic
    - Music centered
    - Neurologic
    - Psychodynamic
    - Other (please specify):
9. What is your highest level of education?
    - Bachelor's degree in music therapy or related field (please specify)
    - Master's degree in music therapy or related field (please specify)
    - Doctoral degree in music therapy or related field (please specify)
10. How long have you been practicing music therapy?
    - 1-5 years
    - 6-10 years
    - 11-15 years
    - 16-20 years
    - 21-25 years
    - 26-30 years

- 30+ years

11. How many hours per week do you work with those that are mechanically ventilated?
    - 1-3
    - 4-5
    - 6-7
    - 8-10
    - 10+ hours

Clinical Practice

12. What is the average length of stay of the patients on mechanical ventilation that you treat?
    - 1-7 days
    - 8-13 days
    - 14 –28 days
    - 1 month
    - 2-3 months
    - 3-4 months
    - 4 –5 months
    - 6 months or longer
13. What is the reason for referral to music therapy? Check all that apply.
    - Anxiety reduction
    - Pain management
    - Improve quality of life

- Improve physiological state
- Cope with hospitalization
- Promote weaning
- Emotional expression
- End of Life care
- Engagement
- Other (please specify):

14. At what level of alertness are the patients you treat referred to music therapy? Check all that apply.
    - Alert (fully awake)
    - Verbal (not fully awake, responds to verbal stimulus)
    - Pain (difficult to waken, responds to pain)
    - Unresponsive
15. What was the average number of mechanically ventilated patients you would treat before the COVID-19 pandemic?
    - 1-3
    - 4-5
    - 6-7
    - 8-10
    - 10+
16. What is the average number of mechanically ventilated patients you treat now?
    - 1-3
    - 4-5

- 6-7
- 8-10
- 10+

17. How many mechanically ventilated patients with COVID-19 have you treated in the last 3 months?

- 0
- 1-3
- 4-6
- 7-9
- 10-12
- 13-15
- 16-18
- 19-20
- 20+

18. How do you determine the patients' music preferences?

- From patient
- Family knowledge
- Medical staff
- Other (please specify):

19. Do you use standardized non-music assessment tools?

- Yes
- No

20. Do the majority of your patients have invasive or non-invasive mechanical ventilation?

- Invasive
- Non-invasive

21. Do you work with patients during mechanical ventilation weaning trials?
    - Yes
    - No
22. What is the format of your music therapy sessions with mechanically ventilated patients?
    - Group
    - Individual
    - Group and Individual
23. What is the size of the music therapy group?
    - 1-3 participants
    - 3-5 participants
    - 5-7 participants
    - N/A
24. What is the duration of your music therapy sessions?
    - Less than 15 minutes
    - 15-30 minutes
    - 30-45 minutes
    - 45-60 minutes
    - Other (please specify):
25. What is the frequency of music therapy sessions per week?
    - 1 time a week
    - 2-3 times a week

- 4-5 times a week
- 6+ times a week

26. What is the average total number of sessions before discharge?

- 1 session
- 2-3 sessions
- 4-5 session
- 6+ sessions

27. What goals do you address in music therapy? Check all that apply.

- Reduce anxiety
- Bereavement/End of life care
- Coping with hospitalization
- Pain Management
- Improve quality of life
- Promote weaning
- Emotional expression
- Engagement
- Other (please specify):

28. What music therapy methods do you utilize in your sessions? Check all that apply.

- Vocal recreation
- Instrumental recreation
- Vocal improvisation
- Instrumental improvisation
- Songwriting

- Song discussion
- Listening to live music
- Listening to pre-recorded music
- Music assisted relaxation
- Unguided imaginal listening
- Directed imaginal listening
- Physiological entrainment
- Other (please specify):

29. Please indicate which music therapy methods you use to address identified goal areas:

Goal Areas: MT Methods:	Anxiety Reduction	End of Life	Coping with Hospitalization	Pain Management	Quality of Life	Promote Weaning	Emotional Expression	Engagement	Cognitive Awareness	Other
Vocal recreation										
Instrumental recreation										
Vocal improvisation										
Instrumental improvisation										
Songwriting										
Song discussion										
Listening to live music										
Listening to pre-recorded music										
Music assisted relaxation										
Unguided imaginal listening										
Directed imaginal listening										
Physiological entrainment										
Other										

Influencing Factors

30. What factors inform your choice of music experiences when treating a patient who is mechanically ventilated? Check all that apply.
    - Diagnosis
    - Reason for referral
    - Theoretical Orientation
    - Scope of practice: defined as the music therapy methods you are qualified to use
    - Patient preference
    - Family preference
    - Level of alertness of the patient
    - Assessment of the patient in the moment

Perception of Efficacy

31. How do you perceive the effectiveness of music therapy with mechanically ventilated patients?
    - 1- not effective
    - 2
    - 3- somewhat effective
    - 4
    - 5- very effective
32. What factors influence your perceived effectiveness of music therapy? Check all that apply.
    - Human connection made through therapeutic rapport built though music

- Response from patient
- Response from staff
- Response from family members
- Opportunity to engage the patient in an activity outside of their normal environment
- The sense of providing autonomy for a patient
- Other (please specify):

33. Please add any information you would like to share about your work with mechanically ventilated individuals:

Appendix B: Survey Invitation

Survey Invitation (sent via e-mail)

Dear Board-Certified Music Therapist,

We are interested in learning more about the current nature of music therapy practice with mechanically ventilated patients.

This survey should take approximately 15 minutes to complete. Results will identify current trends in music therapy practice with mechanically ventilated patients. We are looking for participants who meet the following inclusion criteria:

- Board Certified Music Therapist
- Work with mechanically ventilated patients
- Can read and write English

Please click on the link below if you are willing to participate in this survey and meet the inclusion criteria.

(link)

We thank you for your willingness to participate in this survey.

Sincerely,

Olivia DiIorio

Primary Researcher

Kathleen M. Murphy, PhD, LCAT, MT-BC

Faculty Sponsor/Thesis Committee Chair

Appendix C: HREB Approval

Human Research Ethics Board
Sponsored Programs & Research Compliance
800 Hawk Drive, New Paltz, NY 12561
Old Main B120

STUDY EXEMPTION

March 7, 2022

Olivia DiIorio diiorioo1@newpaltz.edu

Dear Olivia DiIorio:

On 3/7/2022**,** the Human Research Ethics Board (HREB) approved the following submission:

Type of Review:	Initial Study
Title of Study:	Music Therapy and Mechanical Ventilation: A Survey of Current Practice
Investigator:	Olivia DiIorio
IRB ID:	STUDY00003488
Funding:	None
Grant ID:	None
Documents Reviewed:	• DiIorio- Excempt Form Survey Interview Research.docx, Category: IRB Protocol; • DiIorio- Mechanically Ventilated Survey Questions.docx, Category: Surveys/Questionnaires; • DiIorio- Survey Invitation.pdf, Category: Recruitment Materials;
Exemption	104 (d)(2)(i)

The Human Research Ethics Board (HREB) has considered the submission for the project referenced above and determined it to be Exempt under one of the categories specifically waived under Section 104 (d) (1-6) or 101(i) of the Code of Federal Regulations (45 CFR 46).

HREB exemption is given with the understanding that the most recently approved procedures will be followed and the most recently approved consenting documents will be used, if applicable. If modifications are needed, those changes may not be initiated until such modifications have been submitted to the HREB for review and have been granted approval.

As principal investigator for this study involving human participants, you have institutional responsibilities as follows:

1. Ensuring that no subjects are enrolled prior to the study's approval date.

2. Ensuring that the HREB is notified via PACS IRB module of:
- All Reportable Information in accordance with the "Reportable New Information" Smart Form.
- Project closure/completion by the "Continuing Review/Modification/Study Closure" Smart Form in PACS.

3. Ensuring that the protocol is followed as approved by the HREB unless minor changes that do not impact the exempt determination are made.

4. Ensuring that the study is conducted in compliance with all HREB decisions, conditions, and requirements.

5. Bearing responsibility for all actions of the staff and sub-investigators with regard to the protocol.

6. Bearing responsibility for securing any other required approvals before research begins.

If you have any questions, please contact the Human Research Ethics Board (HREB) at either (845) 257-3282 or by email:

HREB Chair: hrebchair@newpaltz.edu HREB Coordinator: hrebcoordinator@newpaltz.edu

Appendix D: Descriptions of Measurement Tools

- **APACHE II**- Acute Physiology and Chronic Health Evaluation II
- **BPS-** Behavioral Pain Scale
- **CAM-ICU-** Confusion Assessment Method for the Intensive Care Unit
- **COMFORT-B-** Comfort-Behavioral scale
- **C-STAI-** Chinese- State Trait Anxiety Inventory
- **STAI-** State Trait Anxiety Inventory
- **RASS-** Richmond Agitation Sedation Scale
- **VAS-A-** Visual Analog Scale- Anxiety