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Effects of non-pharmacological approaches on anxiety, agitation and physiologic parameters in weaning from mechanical ventilation: A systematic review

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Abstract

Background/Aim: Mechanical ventilator weaning refers to the incremental reduction of ventilatory support, facilitating a return to spontaneous breathing. It is essential that this process be carried out by skilled healthcare professionals equipped with both expertise and sound judgment to ensure it is performed at the optimal time and with the most appropriate methodologies. Such diligence is crucial in mitigating the morbidity and mortality associated with the protraction of mechanical ventilation (MV). The extant literature has explored the efficacy of various integrative, non-pharmacological interventions—including music therapy, guided imagery, reflexology, and aromatherapy—in managing the symptomatic burden experienced during both MV and its weaning phase. This study aims to systematically review the findings of investigations that assess the impact of these complementary therapeutic modalities employed by nurses on anxiety, agitation, and the physiological parameters of patients undergoing weaning from mechanical ventilation.

Methods: PubMed, CINAHL, Cochrane Library, Scopus, and Google Scholar databases were systematically searched using the key terms ‘Mechanical ventilator weaning and complementary therapy or non-pharmacological approaches’ and ‘Mechanical ventilator weaning and/or music therapy, reflexology.’ The search strategy was formulated based on the Patient-Intervention-Comparison-Outcome (PICO) framework: P—Adult intensive care patient cohort; I—Application of non-pharmacological approaches in the context of weaning from mechanical ventilation; C—Standard routine care; O—Outcomes related to anxiety, agitation, and physiological parameters. The 10 most pertinent studies, meeting predefined inclusion and exclusion criteria, were selected, encompassing a total of 750 participants. The predominant study design was the randomized controlled trial (RCT). The interventions examined across these studies primarily involved music and reflexology therapies.

Results: Most of the studies reviewed that the use of non-pharmacological interventions reduces patients’ symptoms such as anxiety, agitation, and pain in patients. These methods also contribute to the stabilization of physiological parameters within normal ranges. Moreover, reflexology has been shown to expedite the weaning process from mechanical ventilation, thereby reducing the risk of prolonged mechanical ventilation, a significant challenge for patients and healthcare professionals.

Conclusion: Complementary therapy used in the process of mechanical ventilator weaning is an appropriate intervention to be used to manage patients’ symptoms such as anxiety, agitation, and pain.

Keywords: ventilator weaning, music therapy, reflexology, nature, sound

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Introduction

Mechanical ventilation (MV), which is a life-saving intervention in cases of respiratory failure, cardiovascular surgery, septic shock, pneumonia, and chest and head traumas, is the maintenance of breathing with the help of an artificial ventilator device when the patient cannot perform respiratory function on his own. Approximately one million people in the United States require mechanical ventilation every year, and this requirement is thought to increase over time [1-3].

Weaning is the gradual withdrawal of ventilatory support that promotes a return to spontaneous breathing. In other words, the respiratory function is removed from the machine and performed independently by the patient. This process may last for a single day, several weeks, or several months. Many complications, such as infection, respiratory muscle and tracheal damage, barotrauma, and oxygen toxicity, may develop in intensive care unit patients due to prolonged ventilation [2,4,5].

Currently, the focus is on improving the ventilator weaning processes and reducing the duration of MV to reduce morbidity and mortality rates associated with mechanical ventilation. For effective weaning of patients from MV, weaning should be performed at the right time and with the proper method by an adequate and knowledgeable healthcare professional [1,6].

In addition to the risks associated with prolonged mechanical ventilation, premature weaning from MV poses significant health threats. Repeated intubation, increased mortality and morbidity, prolonged length of stay in intensive care, and MV may occur because of early weaning [7,8]. The decision for separation should be made by providing individualized care to the patient (especially regarding the method of separation) under the guidance of evidence-based practices. While evaluating patients before separation, checklists and protocols developed for the subject should be applied. The first fundamental component of weaning protocols involves using checklists that enumerate objective criteria, facilitating the daily assessment of a patient's readiness for weaning. The second component consists of algorithms designed to guide spontaneous breathing trials with various techniques in stages [9,10].

At the beginning of weaning, the patient was weaned from MV for 5-10 minutes, which could be increased to 30 min depending on patient tolerance. Patients are usually ready for extubation after two or more successful weaning attempts. Healthcare professionals (physicians, nurses, and respiratory therapists) are responsible for providing continuous support by evaluating patients' respiratory efforts during the weaning process. It has been stated that the success of the weaning process increases when nurses are more active, and it is recommended that they take an active role in this process [2].

MV and weaning from MV cause a range of uncomfortable symptoms, such as pain, agitation, sleep deprivation, and anxiety. Unmanaged anxiety stimulates the sympathetic nervous system, causing hyperventilation and respiratory muscle fatigue and resulting in failed weaning attempts [11,12].

Many pharmacological and non-pharmacological techniques manage symptoms observed during mechanical ventilation (MV) and the weaning process. Traditional management strategies primarily rely on antipsychotic, sedative, and analgesic drugs. However, the overuse of these pharmacological agents can lead to various adverse effects, including hemodynamic disturbances, respiratory depression, ileus, prolonged MV, delirium, intestinal dysfunction, and post-traumatic stress disorder (PTSD) [2,13]. Sedation, though commonly used, often addresses only the symptomatic relief of anxiety without targeting the underlying stressors.

Non-pharmacological interventions present valuable alternatives, including music therapy, guided imagery, reflexology, aromatherapy, massage, nature sounds, and animal-assisted therapy. These approaches have demonstrated efficacy in managing anxiety among ICU patients by attenuating stress stimuli and fostering relaxation through synchronizing physiological rhythms, such as respiration and heart rate [14,15]. Compared to pharmacological methods, non-pharmacological interventions are cost-effective, easy to implement, non-invasive, and can support nurses in managing their time more efficiently.

Despite these advantages, there is a need for further research to better understand the impact of non-pharmacological interventions on the MV weaning process. The current evidence base is limited, and a comprehensive examination of these techniques' effectiveness is necessary to optimize clinical practice. This systematic review aims to assess the efficacy of complementary treatment methods, specifically music therapy and reflexology, used by nurses during the weaning of intensive care patients from mechanical ventilation.

Materials and methods

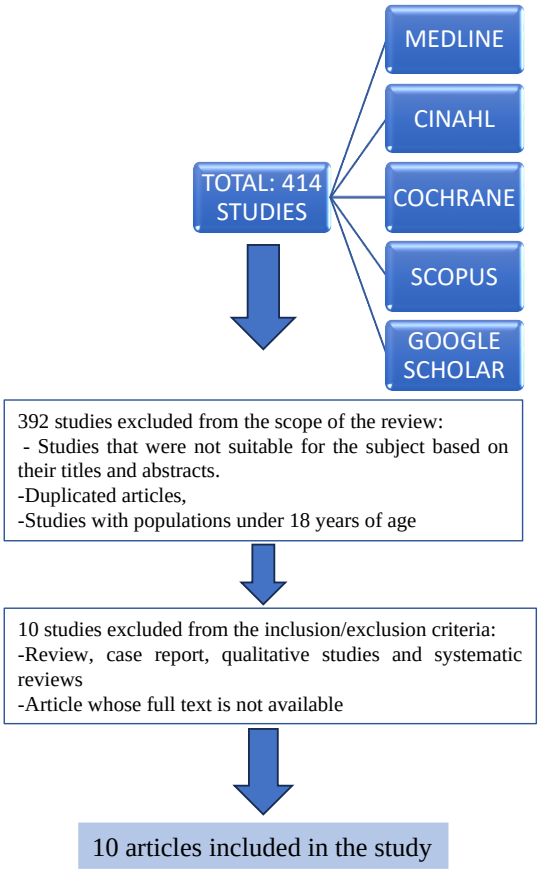
The PRISMA 2020 checklist was used to plan and prepare the research report [17-19]. The literature search, article selection, data extraction, and evaluation of research quality were conducted independently by one researcher and subsequently reviewed by two additional researchers to mitigate the risk of potential bias in our study.

Literature review

This systematic review was conducted to examine the results of studies (randomized controlled trials, case controls, and pilot studies) on complementary treatment methods (music therapy and reflexology) during weaning from mechanical ventilation between January 2010 and June 2023. The MEDLINE, CINAHL, Cochrane Library, Scopus, and Google Scholar search engines were used to determine the sample. Databases were searched using the key terms "weaning from mechanical ventilation and complementary treatment or non-pharmacologic approaches." Within the scope of the publications examined, the searches were also detailed as "weaning from mechanical ventilation and music therapy" and "weaning from mechanical ventilation and reflexology" within the scope of complementary methods applied by nurses. First, the titles and abstracts of the articles were examined. Articles repeated in databases and those conducted in neonatal or pediatric intensive care were excluded. Of the 22 articles determined following the inclusion criteria, those whose full text could not be accessed were excluded. The remaining 10 articles were randomized controlled trials, non-randomized controlled trials, pilot, and randomized prospective trials published in Turkish or English (Figure 1). The literature search was conducted between October 20, 2022, and December

31, 2022, and updated on May 02, 2023, to include the latest publications during the publication process.

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart



Inclusion and exclusion criteria

The Patient/Intervention/Comparison / Outcome / Research Design (PICOS) model was used to formulate the research questions.

P (Population): Adult intensive care patient group

I (Interventions): Use of non-pharmacological approaches for weaning from mechanical ventilation

C (Comparators): Routine maintenance

O (Outcomes): Anxiety, agitation, physiological parameters

S (Study Designs): 6 Randomized Controlled Trials, one non-randomized controlled trial, two pilot studies, and one prospective randomized crossover study.

The selection criteria for research under the PICOS were as follows:

The inclusion criteria were as follows: (1) articles with a sample of adult patients in intensive care, (2) articles published in the field of nursing between 2010 and 2023, and (3) articles for which the full text was available.

The exclusion criteria were as follows: (1) review, validity reliability, case reports, case reports, letters to the editor, and qualitative study design; and (2) articles whose language of publication was not Turkish or English.

Research question

1. Are non-pharmacological approaches used during weaning from ventilators effective for anxiety, stress, and pain levels?
2. What is the effect of non-pharmacological approaches used in the process of weaning from the mechanical ventilator on physiological parameters?

Data extraction, analysis, and quality assessment

As this study is a systematic review, it did not require ethical approval. Systematic reviews analyze previously published data and do not involve direct interactions with human participants. A Data Extraction Form prepared by the investigators was used to identify the characteristics of the included studies when collecting evidence in the current systematic review. Data were collected, including author, year of publication, research aim, intervention, sample size, research designs, evaluation methods, findings, and results. To assess the methodological quality and risk of bias of the studies included in the systematic review, checklists provided by the Joanna Briggs Institute (JBI) were utilized. The Experimental and Quasi-Experimental Research Checklist, validated for Turkish, was employed in this context. The quality assessment consists of 10 items, with each item evaluated as “yes,” “no,” “unclear,” or “not applicable.” A high score on the checklist indicates high methodological quality, although there is no specific cut-off score (Nahcivan & Seçginli, [20]; Hür et al. [21]). The studies reviewed exhibited varying JBI quality scores. Although the majority of studies provided detailed accounts of randomization and blinding processes, several studies were found to have insufficient or absent reporting on these critical methodological aspects. In further support of this, limitations in sample sizes and data deficiencies constrained the generalizability of the results. Consequently, a focus was placed on including studies with a JBI quality score of 6 or higher.

A narrative synthesis method was employed to analyze the data. This approach can combine quantitative and qualitative studies, especially when the results of the experimental studies in a systematic review are too different to be analyzed in a meta-analysis. Given the variability in the outcomes measured across the studies reviewed in this analysis, the findings were presented using the narrative synthesis method.

Results

In this study, ten research articles examining complementary treatment methods that can be applied by nurses during the weaning process from mechanical ventilation were analyzed. The characteristics of the studies are presented in Table 1 under the headings of ‘author/authors (year), aim, intervention, study design and levels of evidence, evaluation method, findings, and conclusions. The studies included in this review employed various designs, predominantly randomized controlled trials, with some pilot studies and non-randomized controlled trials. The variability in study designs and sample sizes may contribute to the heterogeneity of the results. For instance, smaller sample sizes and differing intervention protocols could impact the observed efficacy of the treatments.

The studies included were published between 2010 and 2023. The design type of the studies included in the review was mostly randomized controlled trials (n=6). Two other studies were pilot studies; one was a controlled study without randomization, and the other was a prospective randomized crossover study. The results of the studies analyzed revealed that nurses applied music therapy and reflexology methods during weaning from MV. Our study included 10 studies in which six music and four reflexology therapies were tested.

Table 1: Characteristics of studies using complementary treatment approaches in weaning from mechanical ventilation (n=10)

No	Author(s)	Objective	Int.	Study Design and Levels of Evidence	Sample Size	Evaluation Method	Results	Conclusion
1	Hunter et al. [11]	To determine the effect of music therapy on patients' anxiety levels during the weaning process to evaluate patient/nurse satisfaction with MV weaning trials.	Music	Pilot study The sample received 45-60 minutes of music therapy 3 times a week for 45-60 minutes prior to the allocation trials.	93	Anxiety-related physiological parameters (heart rate and respiratory rate) were measured before and after each music therapy intervention. Satisfaction scale by the patient and the researcher after the separation trials	Patient and nurse satisfaction with the intervention high - Heart and respiratory rates remained within normal values from the beginning to the end of the music therapy. -Investigator assessment of anxiety showed that the patient appeared less anxious after the intervention	Applying music therapy may be effective in mechanical ventilation weaning in patients hospitalized in intensive care units.
2	Aghaie et al. [12]	To examine the effect of nature-based sound therapy on agitation and anxiety during weaning from mechanical ventilation in patients with coronary artery bypass graft.	Nature-Based Music	Randomized Controlled The experimental group closed their eyes for 30 minutes with nature-based sound therapy, such as wind and water flow in a river. -In the control group, the process of wearing headphones and closing their eyes without music for 30 minutes	120	Anxiety: FAS Agitation: RASS Hemodynamic values of the patients in both groups were measured at 20-minute intervals throughout the procedure, immediately after the procedure, and 20 and 30 minutes after extubation. Anxiety and agitation levels were evaluated with simultaneous scales.	The experimental group had significantly lower levels of anxiety and agitation than the control group. The patients' mean systolic and diastolic arterial blood pressure, heart, and respiratory rates in the experimental and control groups showed significant differences (P=0.04).	Nature-based sound therapy may provide an effective method to reduce potential negative hemodynamic responses due to anxiety and agitation during weaning from mechanical ventilation in patients with coronary artery bypass graft.
3	Liang et al. [21]	To examine the effect of patient-selected music interference during weaning from mechanical ventilation.	Music	Prospective randomized crossover The sample was observed for 6 days (3 days with music and 3 days without music). Patients were randomized to the intervention. Music is left to each patient's own choice.	31	On the days the patient played music, physiologic parameters were monitored 30 and 90 minutes before the intervention. On the days when music was not played, it was observed for 90 minutes in the same period. Anxiety was measured with VAS immediately before the intervention and at 30-minute intervals throughout the intervention.	Comparisons between 3 music and 3 non-music days showed significant decreases in respiratory rate and VAS and a significant increase in separation times on music days (P<0.05).	Patient-preferred music playback during daily weaning trials is a simple, low-cost, and potentially beneficial intervention for patients on long-term mechanical ventilation.
4	Kurt and Celik [15]	To examine the effect of nature-based sound therapy on the weaning process from mechanical ventilation of patients hospitalized in the intensive care unit.	Nature-based Music	Randomized Controlled The experimental group closed their eyes for 30 minutes with nature-based sound therapy, such as wind and water flow in a river. -In the control group, the process of wearing headphones and closing their eyes for 30 minutes without music (quiet environment)	64	Pain: FPS Anxiety: MSFS, RASS Arterial blood pressure, heart rate, respiratory rate, oxygen saturation, pain, and anxiety levels were measured and recorded in both groups just before the music and at 10, 20, and 30 min after the separation.	The patients' mean systolic and diastolic arterial blood pressure, heart, and respiratory rates in the experimental and control groups showed significant differences (P=0.04). Pain, agitation, and anxiety levels of the experimental group were found to be lower than the control group.	Nature-based sound therapy applied in the process of weaning surgical patients hospitalized in the intensive care unit from mechanical ventilation support is effective in maintaining arterial blood pressure, heart rate, and respiratory rate within normal limits and reducing pain and anxiety.
5.	Park and Park. [8]	To examine the effects of two different music therapy methods (classical relaxation music versus preferred music intervention) on agitation and anxiety in patients weaned from mechanical ventilation.	Music	Pilot Study Sequence of interventions generated by randomization Half of the sample listened to the music they preferred for the first 30 minutes, followed by a 60-minute rest period and classical relaxation music for the next 30 minutes. - The other half of the sample listened to classical relaxation music for the first 30 minutes, followed by a 60-minute rest period, and then the music they preferred for the next 30 minutes with headphones.	6	Anxiety: STAI and VAS Agitation: RASS Patients in both groups were evaluated with scales before and after the intervention.	Patients' agitation and anxiety levels showed a significant decrease after both the preferred and classical relaxation music interventions. There was no significant difference between the preferred music and the effect of classical relaxation music.	Music interventions focused on patients' preferences or classical relaxation music to enhance relaxation may help reduce agitation and anxiety during the weaning process from mechanical ventilation.
6.	Yadak et al. [22]	To investigate the effect of listening to the Holy Quran in patients during weaning from mechanical ventilation.	Sound therapy/ non-pharmacological treatment	Randomized Controlled -The experimental group was made to listen to the Holy Quran with headphones for 30 minutes. -The control group was allowed to listen with headphones for 30 minutes.	55	Physiologic parameters, such as pulse rate, respiratory rate, systolic and diastolic blood pressures, oxygen saturation, exhaled carbon dioxide, and blood pressure, were measured 5 minutes before and 5 minutes during the application.	Physiologic and clinical parameters were compared between cases and controls, and no significant difference was found.	Listening to the Holy Quran has no negative effect on weaning patients from mechanical ventilation in the intensive care unit.

MV: Mechanical Ventilation, FAS: Face Anxiety Scale, RASS: Richmond Agitation-Sedation Scale, VAS: Visual Analog Scale, FPS: Facial Pain Scale, MSFS: Modified Smiley Face Scale, STAI: State-Trait Anxiety Inventory, ICU: Intensive Care Unit

Table 1: Characteristics of studies using complementary treatment approaches in weaning from mechanical ventilation (n=10)

No	Author	Objective	Int.	Study Design and Levels of Evidence	Sample Size	Evaluation Method	Results	Conclusion
7.	Ebadi et al. [24]	To investigate the efficacy of foot reflexology on physiologic parameters and mechanical ventilation weaning time in patients undergoing open heart surgery	Reflexology	Randomized Controlled 1 hour after admission to the ICU unit - Experimental Group: foot reflexology for 10 minutes on each foot for a total of 20 minutes -Control Group: Routine care -Placebo Group: Simple surface touch without pressure on the heels for 20 min	96	Physiologic parameters: pulse rate, respiratory rate, systolic and diastolic blood pressures, mean arterial pressure, percutaneous oxygen saturation, including monitoring of physiologic indicators. Measured 6 times (immediately after ICU admission, 1 hour after ICU admission, immediately after reflexology, 10 minutes after reflexology, immediately after extubation, and 60 minutes after extubation). Time to weaning from MV was measured. (The time interval between admission to ICU and extubation was considered the time to weaning from ventilation and was measured using a stopwatch).	The study groups did not differ significantly in terms of physiologic parameters (P>0.05). The length of MV weaning time in the experimental group was significantly shorter than in the placebo and control groups (P<0.05).	He demonstrated the efficacy of foot reflexology in shortening the MV weaning time.
8.	Kandemir and Öztekin. [25]	To determine the effects of reflexology on physiological parameters and MV weaning time	Reflexology	Non-randomized Controlled Trial -Experimental Group:20-30 min foot reflexology -Control Group-: Routine care	85	Physiologic parameters (pulse rate, respiratory rate, systolic and diastolic blood pressure, mean arterial pressure, and oxygen saturation) were monitored six times a day. Weaning times from mechanical ventilation were measured.	According to the values obtained before reflexology for the experimental and control groups, pulse rate (P=0.013) and diastolic blood pressure (P=0.021) were significantly higher in the experimental group 5 minutes before reflexology. Patients in the experimental group had lower oxygen saturation values 5 minutes after extubation (P=0.012). However, reflexology did not show a significant change in other physiological parameters, but the time to weaning from mechanical ventilation after reflexology was shorter in the experimental group (P=0.023)	Reflexology has no significant effect on physiologic parameters in patients receiving mechanical ventilation support. It is recommended that weaning from mechanical ventilation be shortened.
9.	Elsayed. [26]	To investigate the effect of foot reflexology on physiological indicators and mechanical ventilation weaning time in open heart surgery patients	Reflexology	Randomized Controlled 1 hour after admission to the ICU unit -Experiment Group: Foot reflexology on each foot for 15-20 minutes -Control Group: Routine care	80	Physiologic parameters: pulse rate, respiratory rate, systolic and diastolic blood pressures, mean arterial pressure, and percutaneous oxygen saturation were monitored. Measured 6 times (immediately after ICU admission, 1 hour after ICU admission, immediately after reflexology, 10 minutes after reflexology, immediately after extubation, and 60 minutes after extubation). MV weaning time was measured with the MV weaning time assessment tool.	There were statistically significant differences between the experimental and control groups regarding all physiologic indicators (P<0.05). Statistically significant differences were also noted in shortening the time to weaning from MV between both groups (P<0.05).	Foot reflexology is an effective method to stabilize physiological indicators and reduce ventilator dependency in patients undergoing open heart surgery.
10.	Allahbakhsian et al. [27]	To investigate the effects of foot reflexology on agitation and MV weaning time in male patients after cardiac surgery	Reflexology	Randomized Controlled(I) - Experiment Group: 30 minutes of foot reflexology massage. - Control Group: Routine care -Placebo Group: 30 minutes of simple surface touch without pressure on the heels	120	Agitation: Before the intervention (Time 1), immediately (Time 2), and 10 minutes after the intervention (Time 3) were assessed using the Richmond Agitation- Sedation Scale. MV weaning time was measured from full consciousness to endotracheal extubation.	Agitation was reduced in all groups from Time 1 to Time 3 (p<0.05); however, the experimental group showed a significantly higher reduction at Time 2 (P<0.001) and Time 3 (P<0.001). Furthermore, extubation time was significantly shorter in the experimental group (P<0.01).	Foot reflexology can be considered as a nursing intervention to facilitate the process of weaning from MV.

MV: Mechanical Ventilation, FAS: Face Anxiety Scale, RASS: Richmond Agitation-Sedation Scale, VAS: Visual Analog Scale, FPS: Facial Pain Scale, MSFS: Modified Smiley Face Scale, STAI: State-Trait Anxiety Inventory, ICU: Intensive Care Unit

Findings of studies applying music therapy

In studies examining the effect of music therapy, one group of patients was generally allowed to listen to music, while the other group was allowed to listen to headphones in bed [12,15,22]. Although the duration, frequency, and timing of music therapy varied between studies, music was applied to patients for at least 30 min a day in all studies. In the study conducted by Liang et al. [23], we attempted to determine the effect of the sample on the separation process by playing music for some days and not playing music for some days. The results indicate that while music therapy generally reduced agitation and anxiety, the effectiveness varied across studies. Differences in the duration, frequency, and type of music therapy and the sample sizes might account for this variability. Further analysis is needed to determine the optimal conditions under which music therapy is most effective.

In the studies in this review, music therapy was performed using nature-based sounds, classical relaxation music, and music genres preferred by patients. In the study conducted by Park and Park [8], the effect of the music therapy method was examined by comparing classical relaxation music with the music style preferred by patients leaving MV. While 206 patients underwent music therapy, the total sample size consisted of 318 patients.

In a few studies, the Richmond Agitation Sedation Scale (RASS), a 10-point scale with four agitation levels (combative, calm and alert, and non-arousable), was used as a measure of sedation efficacy. According to the results of the studies, agitation

and anxiety levels were found to be lower in the experimental groups compared to the control group [8,11,12,15,23]. In these studies, the anxiety levels of the patients were evaluated using the Facial Anxiety Scale and State Anxiety Scale, while pain levels were determined using tools such as the Visual Analog Scale, Facial Pain Scale, and Modified Smiley Scale.

Anxiety, pain, and agitation levels of the patients were evaluated before music therapy, at certain intervals during the procedure, and once or several times at different times after the procedure. Simultaneously, physiological parameters were monitored and recorded, such as arterial blood pressure, heart rate, respiratory rate, oxygen saturation, pulse rate, respiratory rate, and systolic and diastolic blood pressures. Evidence suggests that music can reduce physiological anxiety symptoms in patients receiving MV, such as respiratory rate, heart rate, and blood pressure. In several studies, music intervention groups significantly reduced respiratory and heart rates [8,11,12,15,23]. However, in a study conducted by Yadak et al. [22], no significant difference was found between the case and control groups regarding physiological and clinical parameters.

Reflexology research findings

Studies in which reflexology intervention was applied examined the effects of foot reflexology on physiological parameters and MV weaning time in patients after cardiac surgery. When the studies were examined, foot reflexology was applied to a group of patients for an average of 15 min on each foot, while routine care was provided to the patients in the control group. In the studies by Allahbakhhsian et al. [27] and Ebadi et al. [24], a control group was formed, and the results were compared by applying simple surface touch without applying pressure equal to the reflexology time. In this systematic review, the total number of patients who underwent reflexology was 156 and 155, respectively, and the sample size of the placebo group was 70. Similarly, reflexology was found to shorten the time to weaning from mechanical ventilation in several studies. However, the inconsistency in physiological parameter outcomes suggests that additional factors, such as the exact reflexology techniques used or variations in patient characteristics, may influence the results. It is noteworthy to consider these factors when interpreting the overall effectiveness of reflexology.

Measured physiological indicators that were regularly monitored included pulse rate, respiratory rate, systolic and diastolic blood pressures, mean arterial pressure, and percutaneous oxygen saturation. Physiological parameters were monitored and compared periodically after ICU admission, as well as before and after reflexology application. In a study by Allahbakhhsian et al. [28], in addition to physiological parameters, agitation levels in patients were measured using the Richmond Agitation-Sedation Scale, and the duration of MV weaning was examined. The duration of MV weaning was recorded in hours and days as the interval between ICU admission and extubation.

A common and robust finding of these studies is the shortening of the weaning time from mechanical ventilation following reflexology application, albeit the results of the monitored physiological parameters varied between the groups in the sample. The variability in methodological quality among the studies, including differences in randomization and blinding, as well as sample size limitations, highlights the need for cautious interpretation of the findings. Studies with higher methodological quality and larger sample sizes tend to provide more reliable results, but further research is necessary to confirm these findings across different settings and populations.

In a study by Ebadi et al. [24], the study groups did not differ significantly in terms of physiological parameters. In addition, Kandemir and Oztekin [25] found that the pulse rate (P=0.013) and diastolic blood pressure (P=0.021) of patients in the experimental group 5 min before reflexology were significantly higher than the values obtained before reflexology for the experimental and control groups. In conclusion, most research findings suggest that reflexology does not have a significant effect on physiological parameters in patients receiving mechanical ventilation support. However, Elsayed et al. [26] found a statistically significant decrease in pulse rate, respiratory rate, systolic and diastolic blood pressures, and mean arterial pressure in the foot reflexology group compared with the control group, while a statistically significant increase was found in percutaneous oxygen saturation.

Discussion

In this systematic review, evidence was presented to support the use of music therapy and reflexology in the management of symptoms such as anxiety, agitation, and pain that negatively affect adult intensive care patients during MV weaning. When the literature is examined, the findings of our study are supported by the findings of other studies that systematically examined the effect of music therapy in patients receiving MV support in intensive care [13,16,26]. However, this review focused on nursing research examining the effect of non-pharmacological methods on weaning from MV. Although there is a need to increase the number of studies on the process of weaning from MV, it is seen that the music therapy method examined in this review is an effective method in the process of mechanical ventilation weaning in patients hospitalized in intensive care.

The types of music utilized in the studies, as well as patient preferences and the duration, frequency, and methods of music therapy application, vary considerably. Consequently, there is no consensus or established standard protocol in the literature regarding the specific effects of music types, duration, frequency, or timing.

A review of the studies in the literature evaluating symptoms such as anxiety, agitation, and pain seen in the process of weaning from MV shows that most studies used assessment tools based on self-report or nurse observations. Some of these tools are the Visual Analog Scale (VAS-A), Facial Anxiety Scale (FAS), Spielberger State-Trait Anxiety Scale (STAI), and Richmond Agitation Sedation Scale (RASS). However, the fact that these tools are based on self-report and sedation is applied in most intensive care unit patients makes it difficult to evaluate their reliability.

Kurt and Celik [15] evaluated the pain symptoms in addition to anxiety and agitation different from other studies and concluded that it is an effective method in reducing the pain level. There is a need for further studies in which the subjective pain symptom is evaluated with different scales to strengthen this research finding.

Physiologic parameters such as respiratory rate, heart rate, and blood pressure change in symptoms that negatively affect patient comfort, such as pain and anxiety. These parameters are continuously and closely monitored in patients receiving MV support. Upon reviewing the literature, research findings indicate that music therapy significantly reduces respiratory rate, heart rate, and blood pressure in patients receiving mechanical ventilation support. The literature further reveals a consistent downward trend in heart rate during and after music intervention. In all the studies analyzed in this review, the physiological parameters of the patients in the intervention group were found to be lower than those in the control groups.

Reflexology, a non-invasive and easy-to-apply intervention, regulates autonomic nervous system activity and physiological responses through targeted massage, promoting relaxation by alleviating anxiety [29,30]. The common finding of the reflexology studies included in this review is the shortening of the duration of separation from mechanical ventilation after reflexology application. The mechanism of action of reflexology in shortening this time is not fully understood, and there is much debate on this issue. In addition to this, only a limited number of studies have been conducted on the effectiveness of foot reflexology in reducing the time to weaning from mechanical ventilation. Notably, the samples in these studies have been restricted exclusively to cardiac surgery patients.

Three of the four reflexology studies included in the review reported that reflexology had no significant effect on the physiological parameters of patients receiving mechanical ventilation support. In a study by Elsayed et al. [26], statistically significant differences were observed across all physiological indicators in the group receiving foot reflexology during the mechanical ventilation weaning period compared to the control group. Reflexology was reported to be an effective method for stabilizing physiological parameters and reducing ventilator dependence. Additionally, it was noted that applying reflexology to the foot, hand, and ear led to decreased heart rate, systolic and diastolic blood pressure, and respiratory rate in mechanically ventilated patients. The study concluded that, despite these findings, the available literature on reflexology remains limited, and further research with larger sample sizes and more robust study designs is necessary [31]. Reflexology studies revealed mixed results, which may be attributed to variability in study designs, including differences in randomization and blinding and differing participant characteristics such as age and health status. Additionally, the protocols for administering reflexology varied, with differences in treatment duration, frequency, and techniques. These inconsistencies could have influenced the varying degrees of effectiveness observed across studies.

Limitations

This systematic review included published studies whose full text was available and whose language of publication was English or Turkish. Abstracts and unpublished theses were not included in this review. Many studies had small sample sizes. There is a need for randomized clinical trials that are sufficiently powered to answer the questions posed and for consistent protocols to compare findings across studies.

Conclusion

The results of this study indicate that music therapy is a valuable intervention during mechanical ventilator weaning, effectively managing symptoms such as anxiety, agitation, and pain. This method helps maintain physiological parameters within normal ranges. Additionally, reflexology has been shown to reduce the duration of mechanical ventilation weaning, addressing the challenge of prolonged ventilation for both patients and healthcare professionals. Given these findings, future research should focus on expanding non-pharmacological methods like music therapy and reflexology in the weaning process. Studies should include a wider range of interventions, larger and more diverse sample sizes, and robust study designs to validate these methods. Developing standardized protocols and exploring these interventions' mechanisms and broader patient outcomes will also enhance their clinical application and effectiveness.

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