

Music Therapy in Various Physical and Mental Conditions and Its Effects on Cancer Patients Receiving Radiotherapy

Müzik Terapisinin Çeşitli Fiziksel ve Ruhsal Durumlarda Kullanımı ve Radyoterapi Alan Kanser Hastalarında Etkileri

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ABSTRACT

Music therapy is widely used as a non-pharmacological intervention in a variety of different clinical and therapeutic settings. Several studies have been conducted on the possible effect of music on immediate symptoms, especially anxiety, stress and pain, resulting from disease states and/or invasive medical procedures. The aim of this review is to discuss the use of music therapy in various physical and mental disorders and to examine its effects on adult cancer patients undergoing radiation therapy. The results obtained show that music therapy applications have the potential to be used alone or in combination with standard pharmacological treatment to reduce perceived pain, anxiety and fatigue levels in cancer patients receiving radiotherapy during their treatment and may have positive effects on improving the experience of cancer patients receiving radiotherapy during the treatment process. It is stated that more well-designed research is needed to investigate the effects of music therapy, especially in the field of radiation oncology.

Keywords: Cancer, radiotherapy, music therapy, anxiety, fatigue, pain

ÖZ

Müzik ve müzik terapisi, çeşitli nitelikteki farklı klinik ve terapötik ortamlarda, farmakolojik olmayan müdahale yöntemleri olarak yaygın şekilde kullanılmaktadır. Müziğin, hastalık durumlarından ve/veya özellikle invaziv tıbbi prosedürlerden kaynaklanan, özellikle anksiyete, stres ve ağrı gibi anlık semptomlar üzerindeki olası etkisi ile ilgili çeşitli çalışmalar yapılmıştır. Bu derlemenin amacı, müzik terapi uygulamasının çeşitli fiziksel ve ruhsal bozukluklarda kullanımından söz ederek, radyasyon tedavisi gören yetişkin kanserli hastalar üzerindeki etkilerini incelemektir. Elde edilen sonuçlar, müzik terapi uygulamalarının radyoterapi alan kanser hastalarında tedavileri sırasında algılanan ağrı, anksiyete ve yorgunluk seviyelerini azaltmak için standart farmakolojik tedavi ile birlikte ya da tek başına kullanılma potansiyeline sahip olduğunu ve radyoterapi alan kanser hastalarının tedavi sürecindeki deneyimini iyileştirmede olumlu etkileri olabileceğini göstermektedir. Müzik terapisinin özellikle radyasyon onkolojisi alanındaki etkilerini araştırmak için iyi tasarlanmış daha fazla araştırmaya ihtiyaç olduğu belirtilmektedir.

Anahtar sözcükler: Kanser, radyoterapi, müzik terapi, kaygı, yorgunluk, ağrı

Introduction

Cancer is a significant global health concern, accounting for approximately 13% of all deaths in developed countries. Radiotherapy (RT) is one of the cancer treatment options that employs high-energy radiation to target and destroy cancer cells (Hanedan Uslu 2017). RT can be employed as a standalone treatment or in conjunction with other therapeutic modalities, such as chemotherapy, prior to or following surgical intervention, for the management of diverse forms of cancer (Kizir and Güveli, 2019). It is estimated that approximately 40% of cancer patients require RT at some point during their treatment (Hanedan Uslu 2017). During the RT process, cancer patients receive daily doses of radiation over a period of 2 to 5 weeks. It is important to note that this treatment may result in serious side effects (Khan et al. 2016). In addition to the physical side effects, cancer patients undergoing RT may also experience emotional and social problems, including anxiety, depression, fear, loneliness and hopelessness, as a result of the long-term nature of the treatment and the uncertainty surrounding it (Chen et al. 2013).

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The use of music and sound to influence the human psyche and promote healing has been practised since ancient times. However, the modern understanding of clinical music therapy as a psychotherapeutic health discipline developed after the Second World War. Academic courses, training and national associations have been established worldwide to promote the field of music therapy (Köhler et al. 2020). The Turkish Music Research and Promotion Group (TÜMATA), a prominent center in Turkey for promoting Turkish music and conducting music therapy studies, focuses its efforts on treating physical and mental disorders through its developed clinical activities. This group represents the tradition of music therapy (Çağlar et al. 2021, Peterson 2021, Sezen and Can 2023). The Music Therapy Application and Research Centre (MÜTEM) was established at Üsküdar University in 2013. This therapy employs music genres and brain maps suited to the patients' socio-cultural structure. Music Therapy Association (MÜZTED) was established in Ankara in 2014. It promotes, develops, and advocates for the use of music therapy in society. It also supports music therapy education, research and practice (Jelen and Uçaner 2015). Music therapy is defined as the systematic use of music in a therapeutic relationship. It is used to restore, maintain and promote emotional, physical and mental health. This definition underscores the significance of the therapeutic relationship and differentiates music therapy from other interventions such as music medicine or pure listening interventions (Köhler et al. 2020). Music therapy, a practice that utilizes various types of music for therapeutic aims, can be divided into two main categories: active and receptive. While active music therapy involves the active participation of patients/clients in musical activities, receptive music therapy focuses on listening to music. Active music therapy can involve a variety of methods such as singing, improvisation, songwriting, playing simple instruments, changing familiar lyrics or playing musical games. Receptive music therapy may use pre-recorded music or live performances in sessions. The choice of music is based on the therapist's musical knowledge and extensive repertoire. Receptive music therapy is very useful for patients who cannot participate in active music production, such as those with reduced consciousness or in a coma. These patients can respond to the music they hear and enjoy the benefits of music therapy (Öztürk 2020). The therapist decides which method is appropriate according to the individual characteristics of the patient and the therapeutic goals. Music therapy is a scientifically based therapy that can be used effectively for many health problems (Torun 2020).

Music therapy is used in a variety of healthcare settings, including psychiatry, geriatrics, palliative care and oncology, with the aim of promoting psychological, physical and spiritual well-being. Overall, music therapy plays a key role in addressing the multiple needs of patients and improving their quality of life in the context of life-threatening illness and its treatment. Music therapy is a complementary and creative arts therapy that is widely used in psychosocial cancer care (Köhler et al. 2020). A number of systematic reviews and meta-analyses have shown that music therapy is an effective approach for reducing symptom severity and improving quality of life in cancer patients at different stages of the disease (Chau et al. 2019, Li et al. 2020, Rennie et al. 2022, Sezgin and Bektas 2022). In addition, music therapy is recommended as a treatment option in psycho-oncological care to reduce anxiety or existential fears experienced by patients and their relatives (Köhler et al., 2020).

Music therapy, a healing tool that has existed since ancient times, is now integrated into modern treatment and rehabilitation programmes based on scientific foundations. The application of music therapy has been demonstrated to be an effective means of addressing a number of health concerns, with a positive impact on brain functions and neuroplasticity (the capacity of brain cells to form new connections) (Torun, 2020). RT, crucial in cancer treatment, can lead to various side effects and psychosocial issues in patients. Music therapy is emerging as a promising complementary treatment option to support patients in this challenging process and improve their quality of life. Furthermore, music therapy can assist patients in developing coping skills, expressing their emotions, and strengthening their social support networks (Nardone et al., 2020). Consequently, music therapy should be regarded as a crucial element of psychosocial cancer care and should be included among the treatment options offered to cancer patients. In this context, the objective of this review is to provide a synthesis of the effects of music therapy in adult cancer patients undergoing RT.

Effects of Music Therapy on Physical and Psychological Health

Music therapy has the potential to help people improve their mental, cognitive and motor functions. For this reason, it is an effective therapeutic method for patients who are in hospital or being treated after discharge for physical ailments. The biopsychosocial benefits of music therapy have been scientifically supported and it is reported that it can alleviate symptoms associated with various diseases and improve general well-being (Wellington Ferreira Fontes 2023). Music is a highly complex language that is processed in the human brain. This language influences many aspects of our brain, affecting the cognitive, emotional, sensory, and motor control areas. Listening to music helps to reduce stress and anxiety by reducing the activity of the autonomic

nervous system. It also helps to improve learning and memory by increasing the brain's ability to learn and adapt (plasticity). In addition, music can lead to strong emotional and social responses. By activating our emotional memory and social bonds, music provides the neural basis for many benefits, such as improving mood, increasing motivation and facilitating social bonding (Trigueros-Murillo et al. 2023). This chapter provides proof of the usability of music therapy as a supplementary method for promoting physical recovery of hospital patients in diverse clinical environments and various aspects of mental health. The literature includes studies on the use of music therapy as a supplementary method for treating various psychological symptoms, such as reducing anxiety, improving emotional states, decreasing stress, and easing pain among individuals during physical recovery.

Rehabilitation

In the field of rehabilitation medicine, music therapy is becoming increasingly recognized. It is reported that music therapy can help individuals to recover physically, maintain good health and encourage participation in exercise and activities. Music can alleviate discomfort and difficulties associated with exercise and therapy activities and contribute to consistent participation. Music therapy and rehabilitation medicine share a common place in working with clients with neurological, orthopaedic and paediatric conditions. The therapeutic use of music in rehabilitation has been found to have a positive impact on the quality of life of people with disabilities by contributing to goals such as improving strength, range of motion, balance, communication and cognitive status (Paul and Ramsey 2000). Occupational therapists aim to improve individuals' participation in social life, health and well-being through activities. For this reason, music therapy can be used in occupational therapy to ensure individuals' participation in activities and to improve their quality of life and functionality (Yaman and Öztürk 2024).

Weller and Beker (2011) conducted a systematic review on the role of music therapy in physical rehabilitation, examining its effectiveness, the function of music, and the role of the music therapist in studies which utilized such techniques for individuals with physical disorders. They found that the use of music therapy in the rehabilitation of gait parameters and fine and gross motor functions produced consistently positive and significant results. It was also reported that the benefits of music included increasing motivation, using music as an external timekeeper, and providing focused and structured rehabilitation interventions. The studies reviewed indicated that music therapists engaged patients by using tactics such as instrumental training, behavior assessment, adaptive interventions based on behavior, and provision of physical support. These findings show that music therapy improves physical, psychological, cognitive and emotional functioning in physical rehabilitation (Weller and Baker 2011).

The role of music therapy in treating asthma is significant due to its non-invasive, user-friendly, and relatively affordable character. In assessing the impact of music therapy as an addition to pulmonary rehabilitation on lung function, asthma management, and quality of life for hospitalized asthma patients, individuals were randomly assigned to either the active music therapy group (n=39) or the control group (n=34). During hospitalisation, both groups received standard pharmacotherapy accompanied by respiratory physiotherapy, and all participants' lung function, asthma control, quality of life and serum cortisol levels were assessed at the beginning and end of hospitalisation. During hospitalisation, it was observed that inspiratory closing pressures in the first 0.1 seconds of inspiration decreased only in the experimental group, while changes in asthma control and quality of life did not reach significant levels in either group. It was observed that the effects of receptive music therapy on the mental state of the patients increased the efficiency of the respiratory system (Iliya 2015). Total knee arthroplasty is a common orthopaedic surgery that is known to be very painful. We investigated the impact of combining physical therapy with receptive music therapy, using live music during lower limb pedalling exercises, on pain and exercise compliance by randomising 32 participants. After baseline measurements, two study intervals were performed and the intervention group received live music as receptive music therapy in the first interval and no music in the second interval; the control group received no music in both intervals. Self-reported measures of pain, observed measures of pain, and observed measures of cadence were collected for each participant. The receptive music therapy intervention was found to play a significant role in pain management and treatment adherence during lower extremity range of motion (ROM) exercise, as observed in the combined treatment process (Leonard 2019).

Music therapy has a long history of treating the physiological, psychological and neurological injuries of war. There has been an increase in the use of music therapy and other creative arts therapies in the care of war wounded returning to the United States from Iraq and Afghanistan, particularly those with complex blast-related injuries. In a case report describing the role of music therapy in the interdisciplinary rehabilitation of a severely injured soldier, music therapy was used as a stand-alone treatment and in combination with speech-

language pathology, physical therapy, and occupational therapy. Based on clinical records, self-reports of the patient and his partner, and interviews with members of the rehabilitation team, it was found that music therapy in collaboration with other treatment disciplines contributed to improvements in range of motion, functional use of bilateral upper limbs, strength endurance, respiratory support, articulation, task attention, compensatory strategies, social integration, quality of life and overall improvement. Music therapy was used to optimise the rehabilitation of a soldier as an adjunct to the recovery process from the clinic to the community (Vaudreuil et al. 2019).

The study examined the influence of music therapy on the restoration of motor, language and autonomous functions in patients suffering from ischaemic stroke, using a sample of 45 patients with middle cerebral artery occlusion. Patients were randomised into three groups (main, comparison and control) of 15 patients each. Patients in the first and second groups received receptive and active music therapy and a special exercise set without music on the 3rd, 5th, 7th and 9th day of rehabilitation, respectively. The control group received basic physical exercises. Music therapy was given in three sessions. In the first session, receptive music therapy was implemented. In the second session, active music therapy was facilitated using selected music. In the third session, rehabilitation was performed with the selected music. The patients' state dynamics were evaluated on the 2nd, 4th, 6th, 8th and 10th day. A statistically significant effect of music therapy was shown for all parameters. The researchers suggested that neuroplasticity may underlie the mechanisms of the programmes used in the study (Yakupov et al. 2017). Music education and music-based rehabilitation are known to improve cognitive function and promote neuroplasticity, the brain's ability to reorganise and form new connections. A randomised controlled trial to determine the clinical efficacy of music therapy on cognitive functioning in people with traumatic brain injury (TBI) and to investigate the neural basis of these effects enrolled 40 patients with moderate or severe TBI. Participants were randomly assigned to receive a neurological music therapy intervention for 3 months either in the first half or in the second half of a 6-month follow-up period. The primary aim of the neurological music therapy intervention was to rehabilitate cognitive deficits, particularly executive function, attention and working memory, with a secondary aim of improving mood and emotional adjustment and upper limb motor function. The neurological intervention model used was adapted from Functionally Focused Music Therapy and Music Assisted Education, both used in stroke rehabilitation. Participants underwent neuropsychological and motor testing and magnetic resonance imaging (MRI) at baseline, 3 months and 6 months. Neurological music therapy was found to improve executive function and induce neuroanatomical changes in prefrontal regions. These results provide evidence that music therapy has potential rehabilitative effects in people with traumatic brain injury (Siponkoski et al. 2020). Another study extending the results of this study showed that the rehabilitative effects of neurological music therapy after TBI were supported by intra- and inter-network connectivity changes in cognitive networks, as well as an increased connectivity pattern between frontal and parietal regions associated with music processing (Martínez-Molina et al. 2021).

Neurology

Music therapy is used in the rehabilitation of patients with various conditions such as dementia, Parkinson's disease, fibromyalgia, stroke, aphasia and visual rehabilitation (Strzemecka 2013). It has been shown to improve cognitive function, quality of life and long-term depression in people with dementia (Moreno-Morales et al. 2020). Positive effects have been shown on various aspects of people with Parkinson's disease, including motor function, social skills, communication skills, emotional well-being and cognitive abilities (Machado Sotomayor et al. 2021). Music therapy has been reported to relieve pain, reduce depression and improve quality of life in patients with fibromyalgia (Wang et al 2020).

Music has been used as part of speech therapy to improve recovery of motor and language function in stroke patients (Strzemecka 2013). A meta-analysis evaluating the evidence for the effectiveness of music therapy in improving language function in post-stroke aphasia reported that music therapy could improve functional communication, repetition and naming in patients with post-stroke aphasia, but did not significantly improve comprehension (Liu et al. 2022). Another study found that music therapy applied to middle cerebral artery stroke patients for 30 minutes per day for one month resulted in highly significant improvements in participants' attention, anxiety and depression levels (Pandey and Singaravelan 2019).

A total of 298 Alzheimer's patients, across mild to severe dementia, participated in a randomized trial exploring the impact of music therapy on cognitive function and mental health. Participants with each level of severity were randomly divided into three groups: a singing group, a lyric-reading group and a control group. All participants underwent a battery of tests of cognitive function, neuropsychological symptoms and activities of daily living at baseline, 3 months and 6 months. The study found that active music therapy outperformed

reading lyrics in enhancing verbal fluency, alleviating psychiatric symptoms, and reducing caregiver distress in Alzheimer's patients. Furthermore, this modality showed effectiveness in boosting memory and language skills in mild Alzheimer's patients, and in mitigating psychiatric symptoms plus caregiver distress in individuals with moderate or severe Alzheimer's. However, no significant effect was found on activities of daily living in mild, moderate and severe Alzheimer's patients (Lyu et al. 2018). The objective of this study was to assess the impact of individual music therapy on agitation, psychotropic medication, and quality of life in individuals with moderate-to-severe dementia residing in nursing homes. A total of 42 participants with dementia were randomly assigned to receive either six weeks of individualised active music therapy or six weeks of standard care. The treatment assessment for individualised music therapy was conducted as follows: post each session, the music therapist filled out a form featuring a decision tree that evaluated the usage of five activities on a four-point scale. These activities include vocal or instrumental improvisation, singing, dancing/moving, listening, and other activities such as talking or going for a walk. The severity of agitation exhibited by the participants increased during the period of standard care, but decreased significantly during the course of music therapy. The use of psychotropic medication increased significantly more during standard care than during music therapy. The study concluded that six weeks of music therapy reduced agitation severity and prevented medication increases in people with dementia (Ridder et al., 2013). A randomised controlled trial was conducted to assess the efficacy of group music therapy in alleviating depression and delaying cognitive decline in elderly individuals with dementia. The experimental group underwent 12 sessions of group music therapy, while the control group received standard care. It was reported that group music therapy led to a reduction in depression in people with dementia, with improvements observed immediately after and throughout the therapy. At the sixth, twelfth, and one-month follow-up sessions, improvements were observed in cognitive function, particularly in short-term recall. It was reported that the intervention had the greatest effect on subjects with mild to moderate dementia. Furthermore, it was suggested that group music therapy is a non-invasive therapy method that may be suitable for older people with mild to moderate dementia (Chu et al. 2014). In a randomised controlled trial evaluating the effects of active music therapy and individualised music listening on behavioural and psychological symptoms in people with dementia, 120 participants with moderate to severe dementia and behavioural and psychological symptoms were randomly assigned to two groups. In addition to standard care, the intervention group participated in 20 minutes of active music therapy and individualised music listening sessions twice a week. No significant differences were observed between the groups in behavioural assessment, although positive trends were reported (Raglio et al., 2015). The results of a five-month music therapy programme for individuals with dementia in care homes demonstrated that those who received music therapy exhibited greater improvement in symptoms and well-being compared to the control group. This was evidenced by the observation that residents who received music therapy had greater improvement in symptoms and well-being compared to the control group. The program consisted of individual, active music therapy sessions lasting 30 minutes, held weekly in a quiet room within the unit by a certified music therapist; post-therapy video presentations were also provided for caregivers. The staff members in the intervention group reported an improvement in their care techniques as a result of the programme. In conclusion, the feasibility and acceptability of the music therapy programme for the management of dementia symptoms in care home residents was established. Nevertheless, it was recommended that further studies be conducted with a larger sample size (Hsu et al., 2015).

A mixed-method study was conducted to evaluate the effect of music therapy applied once or twice a week on mood, change in pain and satisfaction in inpatients with a diagnosis of neurological disorder. Semi-structured interviews and focus group discussions were conducted with 14 participants of the music therapy programme (inpatients), 5 family members of the participants and 16 staff members. The results of the study indicated a significant improvement in mood and pain compared to before music therapy. Furthermore, 74% of the participants reported that they were "very satisfied" with the session (Mercier et al., 2023). The study investigated the possible advantages of neurological music therapy in enhancing cognitive impairment, mood, motivation, and quality of life in patients with multiple sclerosis. A total of 30 participants were randomly divided into two groups: a control group receiving traditional cognitive rehabilitation and an experimental group receiving neurological music therapy techniques in addition to traditional cognitive rehabilitation. Both groups underwent treatment for a period of eight weeks. The control group received traditional cognitive rehabilitation six times a week, while the experimental group received traditional cognitive rehabilitation three times a week, in addition to neurological music therapy techniques three times a week. The neurological music therapy techniques employed were Relational Mood and Memory Training and Music in Psychosocial Education and Counselling. Associative Mood and Memory Training involves the use of music to elicit a specific mood associated with material stored in long-term memory, particularly autobiographical memories of the self and past experiences. The primary objectives of Music in Psychosocial Education and Counselling are to facilitate the

identification and expression of emotions, regulate mood, enhance social competence and promote self-awareness. These objectives are achieved through guided music listening, musical role-playing, expressive improvisation or singing, and composition exercises. The results demonstrated that both groups benefited from eight weeks of cognitive rehabilitation, with the intervention group exhibiting superior outcomes in cognitive functioning. Furthermore, the experimental group exhibited greater improvements in emotional state, motivation, mood, and quality of life (mental component) compared to the control group. It was concluded that neurological music therapy can be considered a complementary approach to improve cognitive rehabilitation in patients with multiple sclerosis (Impellizzeri et al., 2020). Amyotrophic lateral sclerosis (ALS) is a rare neurological disorder with a profound impact on the physical, psychological and emotional well-being of patients, as well as on their social and ethical functioning. In a randomised controlled trial assessing the impact of active music therapy on anxiety, depression and quality of life in patients with ALS, the dynamics of communication and relationship during active music therapy were examined as well. A group of 30 patients were randomly allocated to either the experimental or the control group. The experimental group received music therapy in addition to standard care, while the control group received only standard care. The active music therapy programme comprised 12 sessions (three times a week), while the standard care treatment involved physical and speech rehabilitation sessions, occupational therapy and psychological support. The active music therapy group demonstrated a statistically significant improvement in the McGill Quality of Life Questionnaire global scores ($p=0.035$). Additionally, a positive trend was observed in the non-verbal voice-music relationship during treatment (Raglio et al., 2016). In a study involving individuals with Huntington's disease, group music therapy, offered once a week for 16 weeks, demonstrated no additional beneficial effect on communication or behaviour compared to group recreation therapy (van Bruggen-Rufi et al. 2017).

Geriatrics and Palliative Care

A study conducted with individuals residing in a nursing home concluded that music therapy has a beneficial effect on reducing depression levels and systolic blood pressure in elderly individuals (Gök Ugur et al. 2017). A further study yielded results indicating that music therapy was more effective than recreational singing in reducing depressive symptoms in elderly individuals residing in nursing homes (Werner et al. 2017). In a further randomised controlled study, the effects of music therapy on blood pressure, heart rate and anxiety levels in older adults with hypertension residing in a nursing home were evaluated. A total of 60 older adults were randomly divided into two groups: the experimental group ($n=30$) and the control group ($n=30$). Significant reductions in systolic blood pressure, heart rate, and anxiety levels were observed in older adults with hypertension who received music therapy compared to the control group. This study reports that music therapy is a safe, non-invasive, non-pharmacological and cost-effective intervention to reduce blood pressure, heart rate and anxiety levels in older adults with hypertension (Lorber and Divjak, 2022). Eighty-four patients in palliative care were randomly assigned to one of two treatment arms (music therapy and control). The intervention group received two sessions of live music-based relaxation exercises as receptive music therapy. The control group received verbal relaxation exercises. The results indicated that receptive music therapy was more effective in increasing relaxation and well-being. A significantly greater increase in high-frequency changes in heart rate variability was observed in the music therapy group. The increase in heart rate corresponded with increased parasympathetic and decreased sympathetic regulation of the autonomic nervous system's cardiovascular activity. The results demonstrated that music therapy did not differ from the control treatment in terms of pain reduction. However, it significantly reduced the fatigue score on the quality of life scale. It has been demonstrated that music therapy is an efficacious approach to promoting relaxation and well-being in individuals with terminal illnesses who are receiving palliative care (Warth et al., 2015).

Surgery

The study explored the efficacy of music in mitigating pain, anxiety, and vital signs in patients subjected to thoracic surgery. The experimental group ($n=56$) received standard care with a 30-minute receptive music intervention for three consecutive days, while the control group ($n=56$) received only standard care without any music intervention. The researchers employed a range of measurement techniques to assess various factors, including pain, anxiety, vital signs (e.g., blood pressure, heart rate, and respiratory rate), patient-controlled analgesia, and the use of diclofenac sodium suppositories. The experimental group demonstrated a statistically significant reduction in pain, anxiety, systolic blood pressure, and heart rate over time in comparison to the control group. However, no significant difference was observed between the two groups in terms of diastolic blood pressure, respiratory rate, patient-controlled analgesia, and the use of diclofenac sodium suppositories (Liu and Petrini, 2015). A comparison was made between the use of music therapy in conjunction with

intravenous sufentanil patient-controlled analgesia and the use of sufentanil patient-controlled analgesia alone in patients undergoing surgery for lung cancer. Applying intravenous sufentanil patient-controlled analgesia along with receptive music therapy significantly improved pain scores than using only sufentanil patient-controlled analgesia post lung cancer surgery. Furthermore, the study indicates that lower doses of sufentanil can be administered when combined with receptive music therapy, and that patients' cardiovascular parameters (blood pressure, heart rate) are also effectively improved. This suggests that combination therapy may have additional benefits beyond pain relief (Wang et al., 2015). A further study utilising receptive and active music therapy methods demonstrated that music therapy sessions for inpatients following elective orthopaedic surgery resulted in a greater same-day improvement in pain, emotional state and nausea compared to usual care. The methodology included having the patient select a song and listen to it live, performed by a music therapist. The methods we used involved the patient choosing a song and listening to it live, performed by the music therapist. Alternatively, the patient could actively participate by playing an instrument, improvising, singing, discussing lyrics, sharing memories, and using music-assisted relaxation techniques, such as breathing exercises and progressive muscle relaxation. In some instances, more than one target was addressed, and multiple interventions could be employed within a single session. The duration of music therapy sessions was approximately 30 minutes (Gallagher et al., 2018). In the study evaluating the effect of music therapy on chronic pain and mid-term quality of life in patients after mechanical valve replacement, patients were divided into two groups. One group received receptive music therapy for 30 minutes a day for 6 months, while the other received standard treatment with a silent rest period. The music therapy group exhibited significantly lower scores for the emotional item of the pain rating index compared to the control group, and was reported to be more effective in reducing chronic pain. With regard to mid-term quality of life, the music therapy group exhibited significantly higher scores for emotional function than the control group. This indicated that the quality of life of those in the intervention group had improved. Receptive music therapy has been demonstrated to reduce anxiety and pain in patients in the short term, although there is a paucity of research on its effects on chronic pain and quality of life following mechanical valve replacement (Lin et al., 2020).

Interventional Procedure

The study investigated the effect of receptive music therapy on pain intensity, sedation level and physiological parameters during endotracheal aspiration in mechanically ventilated patients in the cardiovascular surgery intensive care unit. A total of 66 patients were included in the study, with 33 patients in the experimental group and 33 patients in the control group. The experimental group received music therapy for 20 minutes before and after aspiration, while the control group did not. Patients who needed aspiration before the first 15 minutes of music therapy were excluded from the study. In the experimental group, the average score of the Critical Care Pain Observation Tool during endotracheal aspiration was significantly lower compared to the control group. No significant difference was observed between both groups in terms of systolic and diastolic blood pressure, heart rate, and oxygen saturation before, during, and 20 minutes post aspiration. Upon evaluation of the results, it was postulated that music therapy may be an efficacious practice for nurses to reduce pain and control sedation levels during endotracheal aspiration of mechanically ventilated patients (Yaman Aktaş and Karabulut, 2016). Chest tube removal is a procedure that can cause significant pain for patients. In a randomised controlled trial involving 180 cardiac surgery patients, we compared the impacts of preoperative ice pack application on the chest for 20 minutes, listening to music for a total of 30 minutes starting 15 minutes before chest tube removal, a combination of these two interventions, and no intervention at all. Both cold therapy and the combined intervention (cold therapy and music therapy) were found to be effective in reducing the pain caused by chest tube removal (Yarahmadi et al., 2018). A randomised controlled clinical trial was conducted involving 304 lung cancer patients. The experimental group received receptive music therapy during the peripheral central catheter insertion procedure and after catheterisation, while the control group received only standard care. The efficacy of receptive music therapy was evaluated by measuring anxiety levels and vital signs, including blood pressure, heart rate, and respiratory rate. The experimental group exhibited a statistically significant reduction in anxiety, diastolic blood pressure, and heart rate over time in comparison to the control group. However, no significant difference was observed in systolic blood pressure and respiratory rate. Consequently, it has been demonstrated that receptive music therapy is beneficial for patients undergoing peripheral central catheterisation (Mou et al., 2020). In the study analyzing the impact of music therapy on drug usage, anxiety, and pain in endoscopy and colonoscopy patients, we split the adult patients scheduled for endocolonoscopy into two groups: one group received receptive music therapy while the other did not. Anxiety scores and pain intensity were evaluated before and after the procedure, while heart rate, mean arterial pressure and oxygen saturation were recorded throughout the procedure. It was observed that the addition of receptive music therapy to deep sedation administered by anaesthesiologists resulted in a reduction in anxiety score and propofol consumption.

Furthermore, patient satisfaction was enhanced, with patients expressing a desire for the same protocol to be employed for subsequent procedures (Bashiri et al., 2018). Similarly, another study demonstrated that receptive music therapy reduced pain and anxiety and increased comfort during colonoscopy (Çelebi et al., 2020). The study aimed to determine the effect of music therapy on patients (n=34) with dental anxiety. In addition, the correlation between salivary cortisol and other physiological parameters was examined. For each patient, salivary cortisol, salivary flow stimulation, blood pressure, heart rate, oxygen saturation and body temperature were measured. At baseline, both groups exhibited comparable levels of anxiety. However, at the second measurement, the music therapy group showed significant differences in salivary cortisol concentration, systolic and diastolic pressure, heart rate, body temperature, and stimulated salivary flow. It has been demonstrated that music therapy has a positive effect on the control of dental anxiety (Mejía-Rubalcava et al., 2015). In a randomised controlled study evaluating the impact of music therapy on pain and anxiety perception in patients undergoing closed nasal bone fracture reduction, the experimental group was exposed to music through headphones before, during and after the procedure. The physiological variables of blood pressure and heart rate were measured. It was observed that the systolic blood pressure ($p = 0.0001$), anxiety ($p < 0.0001$) and pain ($p = 0.0004$) levels of the music group were significantly lower than those of the control group. The use of headphones for music listening demonstrated to be a safe, cost-effective aid in managing discomfort related to procedures such as correcting nasal bone fractures under local anesthesia. For these reasons, it has been reported that receptive music therapy can be considered as a complementary treatment for pain and anxiety management for other medical procedures at similar pain levels performed without general anaesthesia (Ortega et al. 2019). The application of receptive music therapy to patients in the intensive care unit (ICU) has been demonstrated to result in a reduction in anxiety, pain and an improvement in the physiological response of patients in intensive care. In the study examining the effect of receptive music therapy on physiological parameters, pain levels and agitation levels of adult ICU patients on mechanical ventilation, a total of 118 patients were randomly allocated to receive either receptive music therapy or standard care. The music therapy group received 30 minutes of receptive music therapy, which was tailored to the individual needs of each patient. Prior to and following each music therapy session, intensive care nurses employed the Richmond Agitation-Sedation Scale and the Intensive Care Pain Observation Tool to assess the agitation and pain levels of patients. The results of the study demonstrated that receptive music therapy can markedly diminish agitation and heart rate in adult ICU patients undergoing mechanical ventilation. These findings provide further evidence for the benefits of receptive music therapy in the intensive care unit, including intubated patients (Golino et al., 2023).

Psychiatry

A controlled, randomized trial was carried out to assess the impact of music therapy, particularly trauma-focused music and imagery, against standard psychological verbal therapies in treating trauma symptoms in Danish refugees. The results demonstrated that music therapy is not inferior to standard verbal treatment in mental health care for traumatised refugees. Furthermore, research indicates that music therapy, aimed at managing arousal and emotion, could be a culturally adaptive treatment for refugees dealing with complex social and psychological issues stemming from trauma. The sessions, which were conducted in a sitting or lying position, included verbal communication and, optionally, 5-20 minutes of music and imagery work. This approach, which has been termed "receptive music therapy," is based on the principles of trauma-focused music and imagery therapy (Beck et al. 2021).

In a randomized controlled trial comparing active group music therapy, receptive group music therapy, and group counseling for treating major depressive disorder, both therapy groups showed a non-significant decrease in depressive scores relative to the control group (group counseling) at intervals of 1 month, 3 months and 6 months. It was observed that the decrease in depressive scores of the active music group was slightly higher than the receptive music group. There were indications of improved patient-reported outcomes in terms of depression and quality of life, although these differences were not statistically significant. It has been suggested that group music therapy, whether active or receptive, may be a promising adjunctive treatment option for patients undergoing outpatient treatment for major depressive disorder. Further research is needed to fully explore the potential benefits of group music therapy in the treatment of major depressive disorder (Atiwannapat et al. 2016).

Music therapy represents an innovative approach to supporting individuals with severe mental illness and improving their quality of life, self-esteem, spirituality, and psychiatric symptoms. A 13-week active group music therapy intervention, which included singing familiar songs and composing original songs, was found to have a significant positive effect on quality of life and spirituality. The participants reported enjoying the therapy,

experiencing increased self-esteem, and recommending the program to others despite some difficulties (Grocke et al. 2014). In a controlled trial, we compared the effects of physical education, music therapy, and pharmacological treatment alone on a group suffering from mild to moderate depression. Subjects in the pharmacotherapy group received antidepressant medication, while the exercise/music therapy group engaged in physical exercise and music listening. The efficacy of the interventions was evaluated by examining the differences in mood changes between the two groups. The pharmacotherapy group demonstrated a significant improvement in anxiety ($p < 0.05$) at six months, while the exercise/music therapy group exhibited a reduction in anxiety and depression and a decline in the level of TNF- α , a plasmatic cytokine marker of stress, from 57.67 (± 39.37) pg/ml to 35.80 (± 26.18) pg/ml at three and six months. It has been suggested that the intervention may have a role to play in the treatment of individuals with mild to moderate depression (Verrusio et al., 2014). A randomised controlled trial was conducted to assess the impact of music therapy on cognitive functions and depressive symptoms in older adults with mild cognitive impairment and depression. The study involved 80 older adults aged 65 and above, who were randomly assigned to either the intervention or control groups. The intervention group received a receptive music therapy intervention in addition to the standard nursing care, while the control group received the standard nursing care for the same period. The intervention group met four times a week for eight weeks to receive a musical intervention, which included music listening, music discussion, and musical progressive muscle relaxation training. Prior to starting the intervention, a questionnaire was utilized to select suitable musical pieces for the participants, taking into account their age, cultural background, and interests. A significant difference was observed in the intervention group in terms of cognitive function and depression scores before and after the intervention. In conclusion, the study's results indicated that music therapy was an effective method for enhancing cognitive abilities and lessening depressive symptoms in older individuals with mild cognitive impairment and depression. The study showed that music therapy could be successfully used in community environments and nursing homes to improve the life quality of older individuals (Xue et al., 2023). The study was conducted at a single centre and involved a parallel-group, randomised clinical trial with 30 patients diagnosed with obsessive-compulsive disorder. The aim was to explore the impact of music therapy, in tandem with pharmacotherapy and cognitive behavioural therapy, on obsessive-compulsive disorder patients. A single-centre, parallel-group, randomised clinical trial was conducted with 30 patients to this end. Patients who met the eligibility criteria were randomly assigned to receive either music therapy in conjunction with standard treatment or standard treatment alone. Patients in the control group received a selective serotonin reuptake inhibitor (SSRI) and also participated in cognitive behavioural therapy (CBT) with a psychologist. Patients in the music therapy arm received standard treatment as described, in addition to scheduled receptive music therapy sessions three days a week for four weeks. Over the course of the four-week period, each individual participated in 12 sessions of individual music therapy, conducted by an experienced psychiatrist. The intervention comprised receptive music therapy (listening to selected pieces of Iranian classical music composed by renowned musicians) followed by discussions. Consequently, receptive music therapy, in addition to standard care, was found to be an effective intervention for reducing obsessions and improving comorbid anxiety and depressive symptoms in patients with obsessive-compulsive disorder (Shirani Bidabadi and Mehryar 2015).

A meta-analysis evaluating the effectiveness of music therapy in addressing both physiological and psychological stress-related outcomes revealed that the application of music therapy in stress reduction had significant positive effects. It is recommended that further research be conducted to investigate the identified moderators of intervention effects, as well as cultural and methodological factors that may influence the efficacy of music therapy (de Witte et al., 2022). In a further meta-analysis of 32 randomised controlled trials involving 1924 participants, it was demonstrated that a music therapy intervention was capable of significantly reducing anxiety. The study reports that music therapy has positive effects on anxiety in different age groups, country types and session lengths (Lu et al., 2021).

Cancer and Chemotherapy

The efficacy of music therapy in alleviating various symptoms in patients undergoing chemotherapy has been demonstrated in several studies (Li et al. 2020, Rennie et al. 2022, Sezgin and Bektas 2022). However, there is a paucity of data on its effects in the transplantation setting. In a prospective study, patients with lymphoma or multiple myeloma who received autologous stem cell transplantation were randomly assigned to receive either interactive music therapy with a music therapist or no music therapy. As music therapy sessions were individualised and interactive, the study protocol did not standardise music therapy interventions. Instead, a combination of active and receptive music therapy methods was employed according to patient preferences. The music therapy group received two music therapy sessions on days +1 and +5 of the transplantation process. A total of 82 patients were included in the study, comprising 37 in the music therapy group and 45 in the non-

music therapy group. Upon analysis of the results, it was observed that patients who received music therapy exhibited a marginal increase in nausea on day +7 in comparison to those who did not receive music therapy. Both groups exhibited comparable pain scores. Notably, patients who received music therapy utilized significantly less narcotic analgesic medication in comparison to those who did not receive music therapy. These findings indicate that music therapy may be a suitable non-pharmacological approach for pain management in stem cell transplant patients. Nevertheless, further research is required to elucidate the impact of music therapy on patient-perceived symptoms, such as pain and nausea (Bates et al., 2017). In a separate study, it was demonstrated that receptive music therapy, tailored to the preferences of adult patients hospitalized in the blood and bone marrow transplantation unit, may be a preferred and effective intervention for reducing fatigue and pain without the use of pharmacological agents (Reimnitz and Silverman, 2020). Patients who undergo high-dose chemotherapy with autologous stem cell transplantation frequently experience high levels of distress. The study examined the impact of music therapy on various aspects of patient well-being in patients undergoing high-dose chemotherapy and stem cell transplantation, in addition to standard supportive treatment. Active and/or receptive music therapy methods were employed in accordance with the therapeutic needs of the patients. The study revealed that there was no discernible improvement in the general quality of life of the patients. Nevertheless, the study demonstrated that music therapy may have an impact on pain management. As the patients did not exhibit symptoms of depression or anxiety at the outset of the study, no discernible improvement was observed in these areas. The study revealed that the music therapy group exhibited a reduced incidence of serious toxicities, such as mucositis, in comparison to the control group. Furthermore, the use of aprepitant, an antiemetic treatment, was observed to be significantly higher in the control group. Furthermore, music therapy was linked to favourable outcomes with regard to toxicities, antiemetic medication utilisation and immunological alterations. Nevertheless, due to the lack of statistical significance in some of these findings, it has been recommended that further studies with larger sample sizes be conducted in order to confirm these results (Tuinmann et al. 2017).

The study, which compared the efficacy of massage and receptive music therapy in managing cancer-related pain and fatigue in adult patients with acute leukaemia receiving chemotherapy, was conducted randomly with 104 participants in three groups: a light massage group, a music therapy group and a control group receiving standard care. The participants in the massage and music therapy groups received 15-minute interventions three times a week for four weeks. The control group received standard care, which may include usual medical treatments and supportive care. The results of the study demonstrated that the intensity of pain and fatigue exhibited a significant decline over time in the intervention groups (massage and music therapy) in comparison to the control group receiving standard care. In both the massage and music therapy groups, there was a progressive reduction in pain and fatigue intensity from baseline to the fourth week of interventions. The intensity of fatigue did not differ significantly between the massage and music therapy groups, indicating that both interventions were equally effective in reducing fatigue. Nevertheless, the intensity of pain decreased more in the massage group than in the music therapy group, indicating that massage therapy may be more effective in managing pain. The reduction in pain intensity persisted for at least two weeks following the conclusion of the intervention, suggesting that massage therapy may be more effective than music therapy (Miladinia et al., 2021). The study aimed to analyze the impact of music therapy for cancer patients alongside music medicine interventions without a systematic therapeutic process. The aim was to reduce stress, mood and pain and provide psychosocial support through sessions lasting 30-45 minutes. The sessions commenced with an exploration of the patients' current concerns, after which receptive and active music therapy methods were employed in accordance with their specific needs. The participants were afforded the opportunity to express and process their emotions through music. At the start of the music therapy sessions, personalized playlists were provided. The results demonstrated that both interventions were efficacious, yet the majority of participants expressed a preference for music therapy. The findings indicated that music therapy was effective in improving symptom management and strengthening patients' hopes (Bradt et al., 2015).

In the study investigating the effect of perioperative aromatherapy and receptive music therapy in women undergoing breast cancer surgery, 160 patients were randomly divided into four groups. The participants were randomly assigned to one of four groups: aromatherapy, music therapy, combination therapy, or usual care. The combination therapy group demonstrated the most notable improvement in plasma IL-6 and HMGB-1 levels, which were analysed to compare the effects on pain, anxiety, and postoperative stress responses. In comparison to the control group, the aromatherapy and music therapy groups exhibited reduced levels of pain and anxiety. However, no significant differences were observed between the groups (Deng et al., 2022). In a separate study, the impact of receptive music therapy and mindfulness-based stress reduction (MBSR) techniques was assessed in patients with osteosarcoma. The intervention group underwent eight sessions of MBSR and music therapy,

while the control group did not receive any psychological intervention. In each session of the intervention, music therapy was first applied for 30 minutes, followed by MBSR. Thereafter, participants were permitted to listen to music for a further 30 minutes. The interventions were found to significantly alleviate psychological and physiological complications and improve pain, anxiety, and sleep quality in patients. It has been proposed that MBSR combined with music therapy may represent a novel psychotherapeutic intervention (Liu et al., 2019). A pilot study was conducted to assess the feasibility of a mindfulness-based music therapy intervention in adolescents and young adults receiving cancer treatment. The study involved 37 adolescents and young adults aged 15-39 who received cancer treatment for eight weeks. The intervention consisted of four sessions of individual mindfulness-based music therapy, delivered either in person or via Zoom over a twelve-week period. The sessions included music therapy techniques, such as introducing music therapy principles, listening to music, engaging in hands-on music creation, and discussions facilitated by music therapists about using music to modify energy, mood, and encourage relaxation. The participation in mindfulness-based music therapy sessions was associated with a significant reduction in perceived stress and a non-significant change in anxiety. Satisfaction and acceptability were rated highly. Although preliminary findings indicate the potential benefits of mindfulness-based music therapy for adolescents and young adults undergoing chemotherapy, further research through randomised controlled trials is necessary (Knoerl et al. 2022).

A systematic review of the effects of music-based interventions in cancer patients revealed that music-based interventions, including receptive or active music therapy, demonstrated potential in reducing cancer-related pain, fatigue and distress in adults with cancer. The findings indicated that the combination of music-based interventions with standard care was more effective than standard care alone in alleviating cancer-related pain and fatigue. However, the results were inconclusive regarding the efficacy of the combination in reducing anxiety and depression (Trigueros-Murillo et al. 2023). A systematic review was conducted to collate the existing literature on the use of music therapy as a low-risk and effective pain management strategy in addition to conventional cancer treatment. The results indicate that music therapy has the potential to provide both physical and psychosocial benefits to cancer patients. Furthermore, it was posited that the apparent side effects are negligible, and that music therapy should be considered when creating a cancer care plan (Rennie et al., 2022).

A meta-analysis study was conducted to examine the effects of music therapy on the quality of life, anxiety, depression, and pain of patients with cancer. The findings indicate that music therapy has a positive impact on overall quality of life, physical functioning, emotional well-being, social interactions and spiritual connection. It is posited that the most efficacious outcomes are observed after a period of 1 to 2 months, during which patients are encouraged to experience the benefits of music therapy. It is well documented that cancer patients experience high levels of anxiety, depression and pain. Music therapy has been found to be an effective intervention for reducing these symptoms. It has been posited that patients who engage in music therapy sessions may experience an improvement in their general well-being, as a result of the relaxation and emotional release that they experience (Li et al., 2020). In a further meta-analysis, it was demonstrated that music therapy interventions can significantly and positively contribute to the reduction of fatigue in patients with haematological cancer. It is recommended that music therapy interventions be considered as an adjunct to other non-pharmacological or pharmacological methods for the reduction of fatigue in patients with haematological cancer (Sezgin and Bektas, 2022).

A systematic review and meta-analysis study has demonstrated that music therapy can significantly improve the scores of nausea and vomiting symptoms in patients with digestive system cancer during chemotherapy and reduce the incidence of nausea and vomiting in stage 1 and above after chemotherapy (Zhong et al. 2023). In a further meta-analysis study, while acknowledging the necessity for further research, it was demonstrated that music therapy can effectively enhance the spiritual well-being of patients with advanced cancer receiving palliative care. Furthermore, the necessity of adapting music therapy interventions to the particular requirements of each patient, considering variables such as the type of intervention, frequency, number and duration of sessions, is underscored (Huda et al., 2023). In the meta-analysis evaluating the effects of music therapy in different oncological treatment stages, a total of 30 studies were examined. The findings indicate that music therapy has a generally positive effect. During the curative treatment phase, encouraging outcomes were observed in relation to anxiety, depression and the use of pain medication. In palliative settings, improvements in quality of life, spiritual well-being, pain and stress were reported. These findings indicate that music therapy may have a positive effect on psychological well-being, quality of life and physical symptoms at different stages of oncological treatment. It is recommended that future research focus more on better understanding the individual characteristics of patients and the effects of different types of music therapy (Köhler et al. 2020), given that music therapy has been shown to improve health outcomes in cancer patients.

Music therapy is a scientifically based therapy that can provide various benefits in physical rehabilitation. It can aid in patients' physical recovery and health management, inspire their engagement in exercise and activities, and show a considerable therapeutic effect in managing physical symptoms such as nausea, pain, and fatigue, as well as various psychosocial symptoms, including psychosomatic disorders, anxiety, depression, and emotional syndromes. Music therapy can be used as an effective treatment for people recovering from physical illnesses, both inside and outside of healthcare facilities. In conclusion, it appears that the appropriate use of music is cost-effective from a pharmacological point of view and has positive effects on patients as a complementary intervention. These effects have been observed in different patient populations and in patients undergoing invasive procedures.

Effect of Music Therapy on Cancer Patients' Experience of Radiotherapy

Music therapy has been demonstrated to be an efficacious treatment for cancer patients, resulting in an overall improvement in their quality of life. This is evidenced by the direct association between music therapy and beneficial effects on anxiety, pain, fatigue, heart rate, respiratory rate and blood pressure observed in this population (Bradt et al. 2016). RT is one of the treatments used in cancer and can cause significant stress and anxiety in cancer patients, especially due to fear of RT and lack of information about treatment and side effects. However, the role of music therapy for patients receiving RT is not well defined (Nardone et al. 2020).

A study was conducted to investigate the effect of receptive music intervention on reducing pre-RT anxiety in oncology patients. Subjects were divided into two groups: a group receiving music therapy and a control group resting. In the waiting room, the intervention group wore headphones and listened to soft, melodic music at a low volume, with a constant tempo and dynamics. The results demonstrated a significant reduction in anxiety scores in both groups. Nevertheless, the music therapy group exhibited a more pronounced decline in anxiety scores in comparison to the control group, and both groups demonstrated a notable reduction in heart rate and respiratory rate. The results of this study indicate that music intervention can effectively reduce pre-RT anxiety in oncology patients (Chen et al., 2013). It is not uncommon for individuals diagnosed with cancer to experience elevated levels of anxiety as a result of the disease itself and the treatment process. A study conducted with 72 patients undergoing outpatient RT treatment demonstrated that receptive music therapy was an effective method for reducing anxiety levels in patients, whereas those who did not receive music therapy exhibited increased anxiety. The study showed that there was no significant difference in anxiety levels before RT, but a significant difference was observed in anxiety levels after RT. Additionally, the findings suggest that receptive music therapy may be an effective approach for mitigating anxiety during RT (Hanedan Uslu, 2017). In a randomised controlled trial investigating the effects of live music on anxiety levels and perceived waiting time in patients and their relatives before radiation therapy, it was reported that receptive music therapy significantly reduced anxiety and distress and shortened perceived waiting times in the intervention group compared to the control group. The findings indicated that receptive music therapy interventions can enhance patients' and relatives' perceptions of hospital environments by reducing anxiety, distress, and perceived temporal distortion (Rossetti et al., 2023).

A randomised controlled trial was conducted to evaluate the effects of music intervention psychotherapy on anxiety, depression, redox status and inflammation in breast cancer patients undergoing RT. A total of 60 patients who had undergone breast cancer surgery and received postoperative RT were divided into two groups: the control group received RT only, while the intervention group received RT with receptive music intervention psychotherapy in a group setting. The results demonstrated that music intervention psychotherapy had beneficial effects on a number of outcomes, including anxiety, depression, and the redox state of the patients. The findings indicate that complementary approaches, particularly music-intervention psychotherapy, may be a valuable tool for managing mood disorders in breast cancer patients undergoing RT (Zeppego et al., 2021). A study evaluating the effect of receptive music therapy on anxiety and distress during simulation to plan radiation therapy in patients with head and neck or breast cancer reported that the music therapy group exhibited significantly lower anxiety and distress scores compared to the control group. It was reported that the application of culturally-centred, individually-tailored music therapy in radiation therapy may be an effective intervention to reduce stress factors. However, further research is required to define its role in improving patient experience by reducing anxiety (Rossetti et al. 2017). In a further study conducted with women with gynaecological cancer undergoing intracavitary brachytherapy, the use of a relaxation video with music was found to be an effective method of reducing anxiety levels (Chu-Hui-Lin Chi et al. 2015). A total of 60 patients with breast cancer were included in the study, which examined the effects of listening to music on anxiety and stress, with a particular focus on breast cancer patients receiving postoperative curative RT. The patients were

randomly assigned to one of three groups. Immediately prior to the simulation and throughout the initial five RT sessions, receptive music therapy was administered for a period of 15 minutes, with anxiety and psychological distress levels assessed prior to and following the completion of treatment. It has been suggested that the use of algorithmic music applications may facilitate an enhanced therapeutic experience for patients undergoing RT (Raglio et al., 2021). In the study investigating an effective noise control measure for gastric cancer patients receiving RT, it was found that the application of noise reduction technology in the unit in combination with music therapy led to lower noise decibel values, significantly lower anxiety and depression scores, and better sleep quality both day and night in the experimental group compared to the control group. The study concluded that the combination of unit noise reduction technology with receptive music therapy is an effective method for reducing noise levels within the unit and improving the clinical condition of patients with gastric cancer (Zhao et al. 2023). Furthermore, several studies have demonstrated that music therapy can effectively alleviate anxiety in patients undergoing radiation therapy (Smith et al., 2001; Clark et al., 2006).

A study examining the use of self-selected music during the initial RT treatment to reduce anxiety in patients found that participants in both the music and control groups experienced a decrease in anxiety after RT, but there was no significant difference between the two groups. Nevertheless, participants in the music group expressed a desire to listen to music in subsequent RT sessions and reported that they felt supported, distracted, and that the treatment time passed more quickly with the use of music (O'Callaghan et al., 2012). In a study investigating the potential of receptive music therapy to reduce anxiety during RT, the effect of genre-based music selected by participants on anxiety during the first RT treatment was examined. In this randomised study of female cancer patients, groups receiving music therapy and those not receiving music therapy were compared. Anxiety levels were quantified using the State-Trait Anxiety Inventory (STAI) and the Symptom Distress Thermometer (SDT). The patients in the music group were permitted to play their preferred music genre from a web-based application. A 16% decrease was observed in the STAI score in the music therapy group (n = 102), while this decrease was 10% in the non-music therapy group. In terms of SDT scores, a 13% decrease was observed in the music therapy group, while a 2% increase was found in the non-music therapy group. Nevertheless, no statistically significant discrepancy was identified. In conclusion, the study demonstrates that music therapy does not significantly reduce anxiety levels during radiation therapy. This finding suggests a requirement for more studies on the effectiveness of music therapy for cancer patients (O'steen et al., 2021). In a further study, it was reported that music therapy did not significantly affect anxiety levels (Ünal Toprak et al., 2024).

The results of studies in the literature that employed music therapy to reduce anxiety levels in imaging environments were evaluated. A quasi-experimental study was conducted to examine the effects of communication accompanied by music therapy on patients' anxiety levels MRI. The results demonstrated that the anxiety score of the experimental group (n=30) was significantly lower than that of the control group (n=30). Furthermore, the experimental group exhibited a significantly lower pulse rate, although there was no statistically significant difference in blood pressure or physical discomfort between the two groups. With regard to mental discomfort, the experimental group exhibited significantly lower levels of fear and anxiety. The study indicates that communication accompanied by music therapy is an effective alternative method for reducing patient anxiety (Yoon et al. 2016). The results of another study examining the effects of music therapy on anxiety and discomfort in patients undergoing MR tests indicated that music therapy can effectively reduce state anxiety in patients during MR tests (Jeon and Yeo, 2011). In a double-blind, randomised controlled trial with 200 participants, the effects of aromatherapy and music therapy on anxiety during MRI tests were investigated. Participants were randomly assigned to one of four groups: an aromatherapy group, a music therapy group, an aromatherapy plus music therapy group or a routine care group. Aromatherapy was administered via inhalation of lavender oil, while Pachelbel's Canon in D major was employed as receptive music therapy. Consequently, the combination of aromatherapy and music therapy was demonstrated to be efficacious in reducing anxiety and enhancing comfort levels during MRI scans (Wen et al., 2023). The study aimed to determine whether receptive music therapy can reduce anxiety in patients undergoing positron emission tomography (PET-CT) imaging. It is emphasised that these imaging studies may cause anxiety in cancer patients. In the study utilising rhythmic entrainment, a form of music therapy in which the patient's biological rhythm, such as heart rate, is synchronised with live music at the same tempo, a total of 25 patients were included in the study, 20 of whom received the music therapy intervention and 5 acted as controls. No significant differences were observed in heart rate and blood pressure measurements between the pre- and post-testing phases for either group. In comparison to the control group, the utilisation of music therapy demonstrated a higher percentage reduction in anxiety scores and respiratory counts than was observed prior to and following the data collection period. This resulted in an overall greater decrease in anxiety levels (Frye et al., 2020). These results lend support to the existing body of evidence on the efficacy of music therapy interventions in the RT environment.

The efficacy of music therapy in reducing anxiety levels during radiation therapy has been demonstrated in several studies. However, further research with a higher level of evidence is required to confirm the effectiveness of music therapy for cancer patients undergoing RT. Fatigue is a common adverse effect of radiation therapy, and it is well documented that this can have a detrimental impact on the quality of life of cancer patients. Music therapy is used in the context of cancer treatment, aiming to alleviate symptoms like anxiety, depression, and fatigue. In a study investigating the effect of receptive music therapy on fatigue reduction during radiation therapy in women with breast or gynaecological cancer, 116 participants were randomly assigned to either a music therapy group or a control group. The music therapy group received one-to-one sessions from a trained music therapist. The findings demonstrate that the music therapy group exhibited notable enhancements in fatigue, quality of life, and depressive symptoms in comparison to the control group. The findings of this study indicate that individual music therapy sessions may be an effective intervention for reducing fatigue and improving quality of life in women undergoing breast or gynaecological cancer treatment. Nevertheless, the necessity for more meticulously designed research studies to more accurately ascertain the impact of music therapy on fatigue is underscored (Alcântara-Silva et al. 2018). It is hypothesised that the utilisation of music therapy during radiation therapy may have the potential to influence the experience of fatigue in patients. Given the dearth of studies on this topic in the literature, it appears that further well-designed research is required to fully comprehend the impact of music therapy on the fatigue levels of cancer patients undergoing RT. Future studies will provide more comprehensive and reliable evidence on the efficacy of music therapy in the treatment of fatigue in cancer patients receiving RT.

Pain is a common symptom experienced by individuals undergoing cancer treatment. Intracavitary brachytherapy for gynaecological cancers may result in the development of pain. Pain is characterised by a range of symptoms, including back pain and abdominal cramps. However, it can also be caused by immobile lying, applicator insertion or removal. In a study investigating the effect of musical relaxation videos for pain management during intracavitary brachytherapy in women with gynaecological cancer, the experimental group was shown musical relaxation videos, while the control group received standard nursing care. The results demonstrated that the use of musical relaxation videos significantly reduced the perception of pain during the course of treatment. However, this did not result in a reduction in the total amount of opioids consumed. These findings indicate that music relaxation videos may be an effective adjunct to traditional treatments in reducing pain (Chu-Hui-Lin Chi et al. 2015). In a further study conducted with patients undergoing brachytherapy, it was reported that receptive music therapy had a positive effect on pain levels (Ünal Toprak et al. 2024). In a prospective single-arm study, the number of participants in each group session was limited to 10 in order to maintain the high quality of the music therapy sessions. Participants were divided chronologically into groups with no specific selection criteria. The process and content of the interventions in each session varied on a case-by-case basis, according to the professional discretion of the music therapist. Each session was equally divided into 30 minutes of receptive and 30 minutes of active music therapy. The efficacy of music therapy in alleviating pain and improving physical and respiratory comfort in radiation oncology patients has been demonstrated, with an improvement in physiological stress parameters such as heart rate, respiratory rate and oxygen saturation observed following music therapy sessions (Clemens et al., 2023). The findings of the study demonstrate that music therapy has a beneficial impact on pain management during intracavitary brachytherapy in women with gynaecological cancer.

The early detection of physical and mental illness symptoms in cancer patients is of significant importance in the context of their overall health management. It has been demonstrated that music therapy interventions play an essential role in the treatment of psychological disorders, such as depression and anxiety, which are commonly experienced by patients with cancer. A number of studies have demonstrated that music played to cancer patients undergoing RT has a positive effect on pain, fatigue, anxiety and depression management. Nevertheless, given the heterogeneity of patients and the potential for individual variation in response, it is recommended that music therapy be employed in conjunction with a multidisciplinary healthcare team and tailored to the specific preferences of each patient. Further research is required to determine the most effective music therapy approaches, session frequencies and durations for the treatment stages in cancer patients receiving RT.

Conclusion

Music therapy provides an additional method for managing a variety of psychosocial symptoms, including psychosomatic, anxiety, and emotional disorders, as well as numerous physical symptoms. Furthermore, it is used as a treatment to facilitate the physical recovery of patients. Given the potential benefits of music therapy

in rehabilitation, it is recommended that this modality be more widely used and integrated into rehabilitation programmes. The efficacy of music therapy has been demonstrated in the treatment of a range of conditions, including dementia, Parkinson's disease, fibromyalgia, stroke and ALS. Music therapy has been demonstrated to facilitate improvements in cognitive functions, motor skills, emotional well-being and quality of life. Furthermore, it appears to be an effective method for reducing blood pressure, heart rate and anxiety levels in older adults. Given the evidence that music therapy is a safe and effective method that can help manage pain and anxiety and improve overall quality of life after surgery and other medical procedures, it is recommended that this method be more widely used and incorporated into surgical and other medical interventions. Furthermore, music therapy has been demonstrated to be a safe, non-invasive and efficacious method that can be employed to enhance the comfort and well-being of patients during interventional procedures. Music therapy plays an important role in the field of psychiatry, with the potential to be used in the treatment of a wide range of mental illnesses. Music therapy has emerged as an effective method to alleviate symptoms such as nausea, pain, fatigue and anxiety in cancer patients undergoing chemotherapy and stem cell transplantation. Furthermore, studies have indicated that music therapy may result in a reduction in the need for pain medication.

RT is a primary treatment method for cancer, and it can be administered to most cancer patients. It is not uncommon for patients to experience difficulties tolerating RT, concerns about the medical equipment used, and feelings of isolation and anxiety during the course of their treatment. This can have adverse effects on the patient, as it may result in a disruption of the treatment plan. For these reasons, it is important to enhance the patient's experience of the RT process and the environment in the treatment room. Music therapy is a treatment method that can be used alongside radiation therapy for cancer patients, serving as a complementary treatment. It is crucial to acknowledge that music is a cultural product, and its influence may differ among various cultural groups. Consequently, it is necessary to create specific playlists in order to effectively deliver music therapy to groups of people with different tastes. It is hypothesised that the application of music therapy in accordance with the preferences of individuals at each stage RT treatment, from planning to implementation, will be beneficial in improving the quality of life of cancer patients. Furthermore, there is a paucity of literature on the utilisation of music therapy interventions in the management of diverse symptoms experienced by cancer patients in the RT environment. The results of studies on the symptoms that may have positive effects will contribute to the existing body of literature on the subject. In conclusion, it is evident that further research is required to investigate the effects of music therapy, particularly in the field of radiation oncology. Those engaged in healthcare professions who are interested in this topic can contribute to a better understanding of how music therapy can be integrated into radiation oncology practices to improve patient outcomes by conducting further research. It seems that music therapy may offer a promising non-pharmacological approach to managing pain perception and mood disorders in patients undergoing RT. Future studies should be stratified with a larger sample size and adapted to the needs of the patients. It is imperative that the content, delivery and approach of music interventions (which may include listening to live or recorded music, instrumental improvisation, rhythmic auditory stimulation, dancing, songwriting or singing) are more accurately defined. The objective of these methods should be to enhance psychosocial and physical well-being, with a particular focus on mitigating the adverse effects of anxiety, fatigue, pain, mood and quality of life, rather than on the acquisition of musical skills.

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