

The Effects of Music Therapy on Pain in Patients with Neuropathic Pain

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■ ABSTRACT:

The aim of this study was to investigate the effect of relaxing music on pain intensity in patients with neuropathic pain. A quasi-experimental study, repeated measures design was used. Thirty patients, aged 18–70 years, with neuropathic pain and hospitalized in an Algology clinic were identified as a convenience sample. Participants received 60 minutes of music therapy. Classical Turkish music was played to patients using a media player (MP3) and headphones. Participants had pain scores taken immediately before the intervention and at the 30th and 60th minutes of the intervention. Data were collected over a 6-month period in 2012. The patients' mean pain intensity scores were reduced by music, and that decrease was progressive over the 30th and 60th minutes of the intervention, indicating a cumulative dose effect. The results of this study implied that the inclusion of music therapy in the routine care of patients with neuropathic pain could provide nurses with an effective practice for reducing patients' pain intensity.

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Neuropathic pain is a complex phenomenon including serious, independent pathophysiological mechanisms in both peripheral and central nervous systems, and it is associated with partial injury and dysfunction of the peripheral or central nervous system and change in its excitability (Gorden & Love, 2004; Tuncer, İpçi, Aslantaş, & Ulugöl, 2006). The International Society of Pain describes neuropathic pain as "the pain caused by a primary lesion or a temporary disorder in the peripheral or central nervous system" (Meskey & Bogduk, 1994). Neuropathic pain is typically defined as a severe pain (Lambert, 2010). The most common areas where neuropathic pain is felt are the peripheral nerves, plexus, dorsal stem ganglions, spinal cord, and brain. Although its mechanism is not fully understood, neuropathic pain is known as a complex and multifocal pain with severity that increases over time. In patients with neuropathic pain, the treatment is directed at personal symptoms and findings as well as the underlying mechanisms. Primarily, the patient's pain should be alleviated and quality of life should be elevated, because pain lowers the quality of life by affecting the individual physically, spiritually, and socially. Thus, controlling the pain experienced by individuals is of great

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importance to ease the pain of the individuals, elevate their quality of life, reduce complications, and decrease the hospitalization period (Pasero, 2004; Özyuvaci, Altan, & Yücel, 2003; Özveren & Uçar, 2009).

Currently, the most common way of controlling neuropathic pain is using pharmacological methods. Analgesic treatment is also the most common treatment method of alleviating the pain, as it takes effect more rapidly and is easily applicable. However, unconsidered and intensive use of analgesics has some negative aspects. Analgesics can affect some physiological functions negatively, and, particularly when opioids are used, the individual can develop tolerance as a drug is administered in increasing doses. In addition, unconsidered and inappropriate use of analgesics places a burden on both the individual and the economy of the country (Arslan & Çelebioğlu, 2004; Nester & Hale, 2002). With neuropathic pain, other treatment strategies include rehabilitation, cognitive-behavioral treatment, and intervention. Music therapy, which is one of the cognitive-behavioral treatment methods, can also be used in addition to pharmacological methods to control pain, especially when a patient is reluctant to use traditional treatment methods (e.g., analgesics on a daily basis) or is concerned about the toxic effects of the medicines (Chlan, 1999; Chlan, Engeland, Anthony, & Guttormson, 2007). Paterson and Zderad described art (e.g., music, painting) as an important part of the nursing discipline (McCaffrey & Good, 2000). Music has become an important part of different medical settings over the last decades (Esch, Guarna, Bianchi, Zhu, & Stefano, 2004). Music therapy is a branch of health care dedicated to the use of music for emotional, physical, functional, and educational improvement in a broad range of settings and conditions (Esch et al., 2004). In previous studies, music has been shown to have positive physiological and psychological effects on patients (McCaffrey & Good, 2000). Music therapy has been used to decrease pain and discomfort for thousands of years (Smolen, Topp, & Singer, 2002). Relaxing or sedative music is characterized by a slow tempo, repetitive rhythm, gentle contours, and strings (Knight & Rickard, 2001). Relaxing music has been shown to influence a person's emotional feelings and physiological responses. Calm and soothing music is found to be the most appropriate in reducing pain (Wong, Lopez-Nahas, & Molassiotis, 2001).

LITERATURE REVIEW: MUSIC AND PAIN

As one of the oldest treatment methods, music therapy is known to have been used with the aim of treating patients in many cultures for four thousand years (Chlan,

2002). In clinical practice, music therapy is a treatment method ensuring relaxation, healing, and comfort. Music therapy is used therapeutically in hospitals, in intensive care units, through palliative care, during surgical operations, in departments of psychiatry, oncology, gynecology, and pediatrics, in coronary care units, during radiation treatment and chemotherapy, in cases in which medical procedures are applied, for treatment of symptoms such as pain and anxiety, for activation of immune functions, for increasing the body's resistance, for elevating the quality of life, and for moral recovery (Almerud & Peterson, 2003).

Complementary and alternative medical (CAM) therapies are "a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine and strategies that have not met the standards of clinical effectiveness". A complementary therapy is used along with any conventional treatment, but alternative therapies are used instead of conventional treatment (Wong & Smith, 2006). Alternative therapies are biologically invasive and costly, but complementary therapies are a noninvasive, safe, and inexpensive way to reduce symptoms of main care. Complementary therapies include massage therapies, acupuncture, fitness, and mind-body techniques such as music therapy and meditation (Cassileth & Keefe, 2010). In many cultures, music is a complementary factor in the healing process and still constitutes a significant component of medicine. Pain alleviation is the most outstanding and attention-grabbing effect among many benefits of music therapy (Roy, Peretz, & Rainville 2008). By influencing the brain in various ways, music makes a positive impact on both neural functions and hormonal activity. There has been argument as to whether music therapy ensures relaxation by influencing the autonomous nervous system. In addition, many researchers have discussed music therapy in terms of a recovery model making positive impacts on physiological functions (Krout, 2007). Music therapy is a natural intervention having an effective role in physical, psychological, social, emotional, and moral recovery; it is easy to apply and to use; it is cost-effective; and it does not have adverse effects (Chlan, Tracy, Nelson, & Walker, 2001; Chlan, 2002). Rossi (1993) reported that music causes changes in the mind-body process as well as in the autonomic immune, endocrine, and neuropeptide systems. Music (Thaut, 2005) is perceived by the temporal lobe, which is the hearing center in the brain, and causes stimulus in the thalamus, medulla, hypothalamus, midbrain, and pons (Le Scouarnec et al., 2001). Music influences the right hemisphere of the brain, causes physiological responses through the limbic system, results in

enkephalin and endorphin release and, in turn, causes a decrease in the severity of pain (Le Scouarnec et al, 2001).

Studies conducted on different patient groups have reported the pain-alleviating effect of music therapy. Menegazzi, Paris, Kersteen, Flynn, and Trautman, (1991) determined that music reduced the severity of the pain perceived by patients resorting to emergency service because of injuries. Zimmerman, Nieveen, Barnason, and Schmaderer (1996) also reported that music decreased the pain perceived by patients who underwent a coronary artery bypass graft (Zimmerman et al, 1996). In a similar study, Sendelbach, Halm, Doran, Miller, and Gaillard (2006), reported that listening to music for 20 minutes decreased the pain perceived by patients in the postoperative period (Sendelbach et al., 2006). In research conducted by Özer, Karaman Özlü, Arslan, and Günes (2010) to examine the impact of music therapy on postoperative pain among patients who had undergone open heart surgery, it was found that music selected by patients and listened to for 30 minutes decreased pain scores. Şen et al. (2009) reported that potential Cesarean patients who listened to music had decreased pain perception, as well as decreased need for analgesics, in the postoperative period. Sidlecki (2009) also determined that patients with chronic and nonmalignant pain who listened to music for 60 minutes had reduced levels of pain perceived by them. Huang, Good, and Zauszniewski (2010) also found that listening to music for 30 minutes decreased the level of pain in cancer patients. Onieva-Zafra, Castro-Sanchez, Mataran-Penarrocha, and Moreno-Lorenzo (2013) reported that patients diagnosed with fibromyalgia who listened to music for 60 minutes had reduced levels of pain perception.

Despite the implications of the aforementioned research that has examined the effects of music therapy on pain, no study has been conducted to examine the possible effects of music on patients with neuropathic pain. The aim of this study was to investigate the effect of listening to Classical Turkish Music on self-reported pain intensity in patients with neuropathic pain.

METHODS

Ethical Considerations

This study was approved by the Ethics Committee of the School of Medicine, Ege University, Izmir, Turkey. Permission to conduct the study was obtained from the Director of Nursing and Clinical Services. All patients were informed regarding the procedures of the study, and informed consent was obtained from each of the participants.

Study Design

A quasi-experimental repeated measures within-subject design was used in this study to test the effects in question. The Algology clinic of a university hospital in Izmir was used for the study. Patients diagnosed with neuropathic pain or peripheral neuropathic pain using the pain screening tool Douleur Neuropathique 4 questionnaire (DN4) underwent clinical examination by an expert inquiry using the Turkish version of the form (Unal-Cevik, Sarioglu, & Evcik, 2010). All patients were receiving standard treatment for neuropathic pain, and moderate pain relief had been provided. On the day that the music treatment was given, no kind of analgesic was given before, during, or immediately after the music treatment.

The research hypotheses for the study were (1) music sessions administered to patients with neuropathic pain reduce pain intensity scores over specified time points, and (2) there are significant differences between the 0-minute and the 30-minute, the 0-minute and the 60-minute, and the 30-minute and the 60-minute scores, in terms of mean visual analog scale pain intensity scores reported by patients with neuropathic pain.

Patient Selection Criteria

Sample size was determined based on repeated measures ANOVA power analysis. Power analysis revealed that a sample size of 30 would achieve a power of 100% using an alpha coefficient of 0.05. The target population for the research was those patients who were hospitalized in the Algology unit of the hospital. A convenience sample ($n = 30$) was taken from patients who met the study criteria and were hospitalized in the Algology unit between January 1, 2012 and June 1, 2012. The sample consisted of 16 females (53.3%) and 14 males (46.7%) who were all of Turkish nationality, were aged 18 to 70 years (mean, 51.26; $SD = 11.74$), had no psychiatric illnesses, had not taken any sleep aid or sedative drug, had not been receiving any complementary and alternative treatment method, and were able to hear.

The patients selected for the sample had not been given any nonpharmacological treatment or any integrative therapy before the music therapy was administered. Only the pharmacological treatment was specified in the patients' treatment protocol. The selection of patients was based on their declarations during interviews that they had not received any integrative therapy by their own choice.

Demographic data collected from the patients' medical records comprised years of neuropathic pain diagnosis, age, gender, education level, duration of pain, and frequency of pain.

Intervention

Patients received 60 minutes of music therapy. They listened to relaxing music, instrumental, consisting of Nihavend mode Turkish Classical Music with 60–66 beats per minute, using a media player and headphones. Music with this beat was chosen by a music therapy expert because it is believed to have a positive emotional effect on people (Chlan 1998, Chang & Chen 2005), and is also believed to have the most relaxing effect compared to other musical beats. Nihavend mode has had a very significant place in the history of Turkish music. It has been one of the two most common modes of Turkish music for more than a century. As the Nihavend mode scale has a minor structure corresponding to the D minor scale in Western music, it has soft sounds, it does not wear down the human musical ear, and it is traditional and has a relaxing impact on a person. Melody structure, type of melody, and rhythm structure were taken into consideration when choosing the selected melodies. While combining the melodies, an attempt was made to select the tempos that are widely used in Turkish music and that are popular. Mainly, Nim Sofyan (double time), Sofyan (four time) and Aksak Semai (ten time) tempos were used. In selecting the melodies, rhythm diversity was achieved by following a slow-fast-slow motion. The chosen pieces consisted of instrumental works. The music CD prepared by the researcher started with an improvised cello performance containing the sounds of nihavend mode followed by nihavend prelude and nihavend longa, and ended with nihavend saz semai.

Instruments

Data collection included demographic data: age, gender, education level, duration of pain, the frequency of pain, and years of neuropathic pain diagnosis. The measures used in this study consisted of one standardized instrument: visual analog scale (VAS). The VAS is a simple and often-used method for evaluating variations in pain intensity (Lazaro, Bosch, Torrubia, & Banos, 1994) and other subjective clinical phenomena. Patients are instructed to indicate the intensity of the pain by marking a 100-mm line anchored with terms describing the extremes of pain intensity. Its usefulness has been validated by several investigators in the setting of chronic pain (Ahles, Ruckdeschel, & Blanchard, 1984; Price, McGrath, Rafii, & Buckingham, 1983). Gonzalez, Stewart, Ritter, & Lorig (1995) reported that the reliability of the Spanish version of VAS was 0.64 in Hispanic persons with chronic arthritis and that there was a strong correlation (0.72) with the visual numeric pain scale, supporting its construct validity. Daily pain

was measured using the VAS at bedtime. Pain intensity was measured by using a vertical visual analog scale (VAS) from 0 to 10, with high numbers meaning greater pain intensity.

Data Analysis

Power analysis was used to determine sample size. Using the VAS to distinguish results between the applications with a power of 100% and to achieve the difference between the time periods evaluated with a power of 100%, it was determined that a sample size of 30 was sufficient for this study. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows (version 17.0). A 95% confidence interval (CI; $\alpha = .05$) was considered in all tests.

A repeated measures analysis of variance (RM ANOVA) was used to examine mean VAS scores across the intervention period, measured at 30-minute intervals within groups. For that purpose, the mean VAS scores at 0 minutes, 30 minutes, and 60 minutes of the therapy were named VAS1, VAS2, and VAS3, respectively, and treated as the levels of the within-subject factor in the RM ANOVA analysis.

For this reason, the Bonferroni test was used to examine the difference between the intervals within groups and to examine the interaction between group and times. The Bonferroni contrasts were carried out for the comparisons of the mean VAS scores measured at three time points: between 0 and 30 minutes, 0 and 60 minutes, and 30 and 60 minutes, after obtaining a significant within-subject effect. Repeated measures analysis of variance (R_ANOVA) was used to examine the effects of sociodemographic characteristics on the difference in the VAS score of pain occurring during the music therapy in the group.

RESULTS

Demographic Characteristics

The study participants ranged in age from 18 to 70 years (mean, 51.26 years; SD, 11.74). The sample consisted of 30 Turkish subjects, 16 female and 14 male. Most of them were educated to primary school level ($n = 11$), 10 to secondary school level, and 9 to high school or university level. The patients' number of years diagnosed with neuropathic pain ranged from >5 years to >20 years. Mean year of diagnosis in patients was 7.63 years (SD, 7.27). All of the patients experienced pain simultaneously with their periods of diagnosis. It was determined that 66.7 % of patients suffered from pain frequently, 26.7 % of them experienced pain occasionally, and 6.6 % of them seldom experienced pain. Age, gender, and educational level had no effect on pain scores. There were no statistically significant differences

in the baseline data of the frequency of pain, pain scores in the patients ($p > .05$).

The Effects of Music Therapy

The average VAS1 pain score of patients was 5.80 ± 2.13 before the start of music therapy (0 minute). At the 30th minute of music therapy, the average VAS2 pain score of patients was reduced to 4.10 ± 2.15 . The average VAS3 pain score of patients was found to be 2.47 ± 1.75 immediately after the music therapy (60th minute of the music therapy). The change in the average VAS pain scores across three time points was found to be statistically significant ($p = .001$) (Fig. 1, Table 1), showing a significant declining trend from the beginning to the end time points ($p = .001$) (Table 1, Figs. 4, 5, and 6). Thus, it was concluded that music therapy decreased the pain level of patients.

There was a statistically significant difference in pain score over time ($p = .001$, Fig. 1). A correlating relationship was found between pain score of VAS over time in all patients (Fig. 2). A linear relationship was found between VAS score averages (Fig. 3). A linear relationship was also found between VAS1 and VAS2, VAS1 and VAS3, and VAS2 and VAS3 score averages (Figs. 4, 5, and 6). There was a significant difference in pain score between 0 minutes and 30 minutes ($p = .001$), 0 minutes and 60 minutes ($p = .001$), 30 minutes and 60 minutes ($p = .001$) in the music intervention group (Table 2).

DISCUSSION

Neuropathic pain is difficult to treat by clinical methods. Nonpharmacological treatment options can

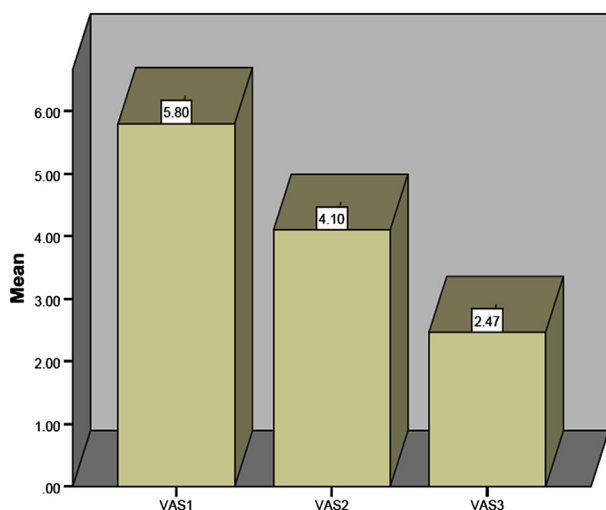


FIGURE 1. ■ Mean pain score of visual analog scale (VAS) over time.

TABLE 1. Over Time Variation in VAS Mean Scores

	Mean	SD	Bonferroni (Mean Different)		
			Time 1 (0 min)	Time 2 (30 min)	Time 3 (60 min)
VAS1	5.80	2.13		1.70*	3.33*
VAS2	4.10	2.15	1.70*		1.63*
VAS3	2.47	1.75	3.33*	1.63*	

Multivariate test (Pillsis Trace) $F(2.28) = 176.30, p = .000, \eta^2 = 0.93$.
* $p < .05$.

help in this regard. Music has been recognized and specifically used as a therapeutic intervention since the middle of the 20th century. However, it has existed in various forms in most cultures for many centuries. In recent years, the use of music as an intervention has increased and this, to some extent, may reflect the growing interest in complementary therapies.

Music was used in this study as a nonpharmacological nursing intervention to facilitate the relief of pain. Music therapy reduced pain among patients with neuropathic pain. Pain scores decreased over time for the subjects in the music therapy group. These findings

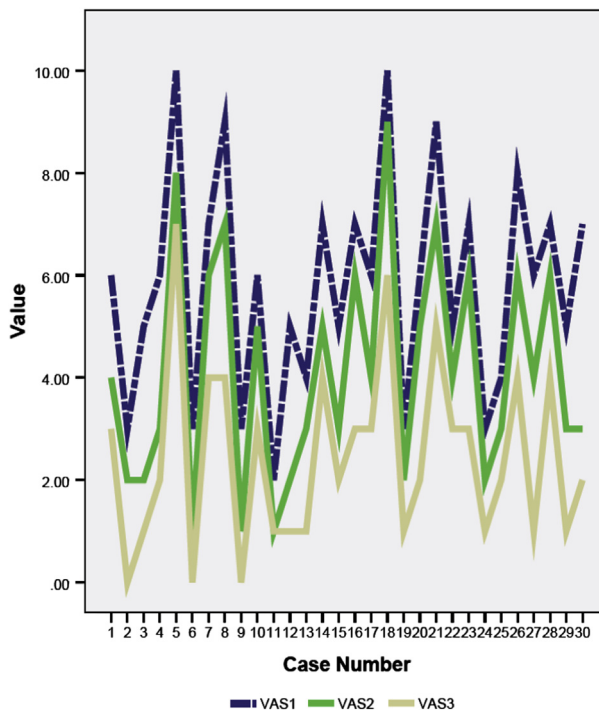


FIGURE 2. ■ Mean correlation pain score of VAS over time in all patients.

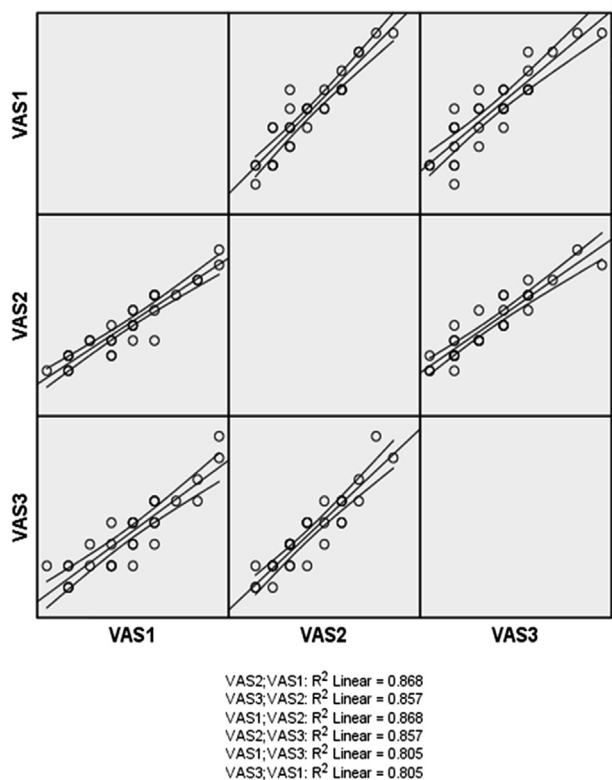


FIGURE 3. ■ Linear relationship between mean VAS scores.

were supportive of the hypothesis that music had a significant effect in reducing visual analog scale pain scores in patients with neuropathic pain.

Findings from this study on pain scores were congruent with other studies of decreased pain scores in

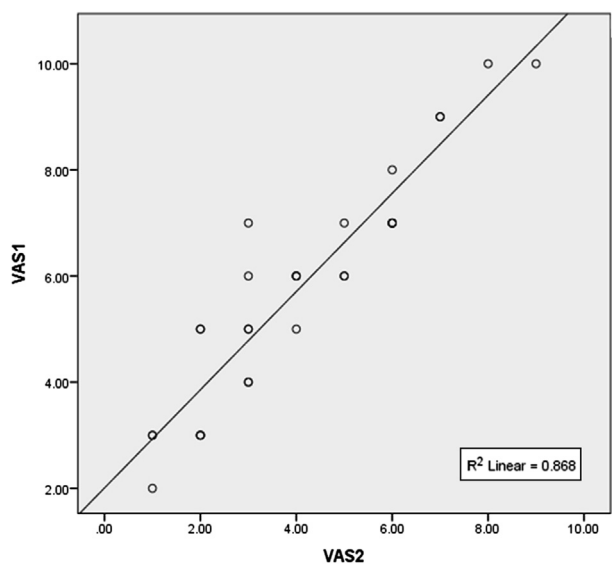


FIGURE 4. ■ Linear relationship between VAS1 and VAS2 mean scores.

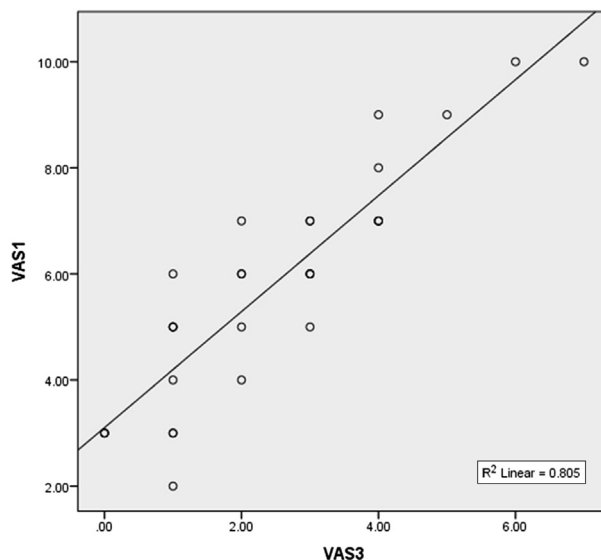


FIGURE 5. ■ Linear relationship between VAS1 and VAS3 mean scores.

patients with different pain in response to music therapy intervention (Onieva-Zafra et al., 2013; Özer et al., 2010; Siedlecki, 2009). In a study by Şen et al. (2009), a significant decrease in pain scores and the amount of analgesia were found during music therapy sessions, and a corresponding rise was found after abdominal surgery. In a study by Özer et al. (2010), a significant fall in pain scores was found during music therapy sessions, and a corresponding rise was found after open heart surgery (Özer et al., 2010). In a study by

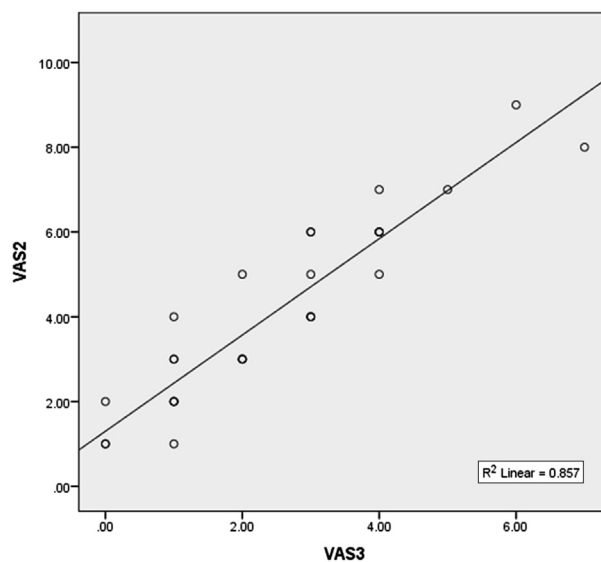


FIGURE 6. ■ Linear relationship between VAS2 and VAS3 mean scores.

TABLE 2.
Significance of the Difference between Mean VAS Scores of Patients Measured at Different Times

Measured at Different Times	0 min	30 min	60 min
0 min		*	*
30 min	*		*
60 min	*	*	

*Statistically significant ($p = .05$).

Sendelbach et al. (2006) of patients recovering from surgery, it was shown that pain scores decreased during the music intervention compared with the baseline. Systematic reviews on music therapy indicate that music therapy is effective in reducing pain scores. Despite the results of various studies examining the effect of music therapy on pain with different sample groups, there has been no study examining the effect of music on neuropathic pain. However, the effect of music therapy on pain has been indicated in a limited number of studies conducted on different patient groups experiencing chronic pain. As neuropathic pain is also a chronic pain, the results of this study should be examined. Siedlecki et al. reported that patients with chronic nonmalignant pain who listened to music for 60 minutes reduced the level of pain perceived by patients. In a study conducted by Onieva-Zafra et al. (2013), the effect of music on pain in patients diagnosed with fibromyalgia was examined. Music was listened to for 60 minutes by the patients of the experimental group. When the average pain scores of patients were examined, it was determined that patients in the experimental group had lower score averages than the patients in the control group, and the difference between the groups was statistically significant. Huang et al. (2010) also reported that patients who listened to music for 30 minutes had decreased levels of pain. It was found that, by the 30th minute, music therapy began to affect pain scores. This effect increased by the 60th minute. These findings were supportive of the hypothesis that there were statistically significant differences between 0 minutes and 30 minutes, 0 minutes and 60 minutes, and 30 minutes and 60 minutes in patients in terms of mean pain scores.

The results indicated that music therapy had decreased pain scores. The decreasing trend continued in the 30th and 60th minutes of the intervention, implying a cumulative dose effect. This suggests that music therapy should be used over periods of at least 60 minutes. Age, gender, and educational level had no effect on

pain scores (Özer et al., 2010; Onieva-Zafra et al., 2013). Also, there was no statistically meaningful relationship between age, gender, or educational level and pain scores. Patients may need time to become accustomed to the music. It is reported that subjects became more relaxed as they listened to the music more frequently (Lee, Chang, Chan, & Chan, 2005). Therefore, the fact that patients listened to a single music intervention session and that the duration of the music session was limited might have influenced the results of this study.

CONCLUSION

Pain scores were reduced significantly after completion of music therapy. Findings supported the benefits of music therapy for patients with neuropathic pain. Music has an influence that can be used as a therapeutic tool for lowering pain scores in patients with neuropathic pain. Music is a safe intervention that is not detrimental to patients. Music therapy can be applied with the advantage of managing pain in patients with neuropathic pain without risking unwanted side effects.

Music therapy is a noninvasive, inexpensive, and non-time-consuming nursing intervention. It is recommended that studies be conducted to explore the optimal time, duration, or number of music sessions to be used when implementing music therapy. Nurses who work in Algology clinics may apply therapy as a non-pharmacological intervention to decrease pain scores in patients with neuropathic pain.

Relevance to Clinical Practice

Three relevant points should be considered with respect to music therapy: (1) music should be considered as a first-line therapy to allay pain in patients with neuropathic pain, (2) nurses should include music therapy in the routine care of patients with neuropathic pain, and (3) further research is needed to explore the effect of the duration and kind of music sessions to be used on patients with neuropathic pain.

Limitations

Each subject underwent the music session at different times during the day. The pain score might be affected by the time of the day at which the data were collected. The choice of musical selection might constitute another limitation. Patients were not able to select the type of music. Music that is relaxing for one person might not be relaxing for another. The efficiency of music to act as a pain-reducing agent is dependent on the type of music used, the preferences of the patient, and the patient's interest in music. Because of cultural diversity among the patients, their choices might differ. To provide standards in the research, the choice of

music was not left to patients, and Nihavend makamı Turkish Classical Music, which is known to have a therapeutic effect, was used in the study.

As the sample of the research consisted of only the experimental group, the results were not compared to a control group. However, the effect of the music

therapy was determined with measurements obtained at different time points.

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