

# The Effect of Music and Massage on the Pain Scales and Vital Signs of ICU Patients with Hemodialysis Catheter

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## ABSTRACT

**Objective:** Uncontrolled pain with any ICU patient may affect the course of medical applications negatively. Insertion of a hemodialysis (HD) catheter is a painful process. The main aim of this study is to evaluate the effect of music and massage on the pain level during hemodialysis catheterization.

**Methods:** This randomized controlled prospective trial was conducted on 220 patients who were hospitalized between January 2020 and July 2020 due to emergence of HD. Fifty-eight patients were listened to music with headphones while another 58 were hand massaged and another 56 were listened to music during hand massaging, and 50 patients were monitored without any extra applications.

**Results:** The average APACHE-2 (Acute Physiology and Chronic Health Evaluation) score of the patients was 19.57±8.98. The respiratory rate and heart rate of Music&massage (Mm) group was lower than the starting ( $p=0.027$ ,  $p=0.043$ ). There was a decrease in BPS (Behavioral Pain Scale) of intubated Mm and music group ( $p=0.001$ ,  $p=0.000$ ). Considering non-intubated patients, Mm, only music and only massage groups showed a significant decline in terms of WONG (Wong-Baker faces pain rating scale) ( $p=0.000$ ,  $p=0.001$ ,  $p=0.000$ ). The Mm group showed that patients were more sedatized in terms of RASS (Richmond Agitation-Sedation Scale) ( $p=0.046$ ).

**Conclusion:** Use of music and massage during HD catheterization in ICU has contributed to improved vital signs and less pain along with more sedatized patients.

**Keywords:** Complementary medicine, hemodialysis, intensive care unit, massage, music, pain

## INTRODUCTION

Pain is one of the main stress factors for intensive care unit (ICU) patients. Endotracheal intubation, chest tube insertion, hemodialysis (HD) catheterization, deep respiration and coughing exercises, endotracheal aspiration, wound care, changing bed position, being bedridden for a long period, and other situations known to cause pain (1). Approximately 33% of ICU patients experience pain in bed, whereas almost half of them feel pain during healthcare processes (2, 3). Severe pain negatively affects hemodynamic stability and immunity (4). Therefore, studies have been conducted to determine whether complementary medicine would help pain management in the ICU. The Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU (PADIS) guideline suggests the use of music and massage, two complementary medicine methods, to ICU patients to decrease pain and anxiety (5). Music arouses both physiological and psychological responses in the listener (6). Listening to music affects the right lobe of the brain and triggers morphine and endorphin

secretion while lowering adrenaline level, heart rate, and blood pressure (7). The use of massage to treat patients is a traditional method (8). Studies have shown that massage therapy increases lymphedema, endorphin level, and body temperature while decreasing anxiety, depression, blood pressure, and heart rate along with sleep regulation (9). Applying massage therapy in the ICU is simple and has no negative physiological effect (9). According to PADIS guideline, only a limited number of studies on the use of music and massage therapies are found in the literature (5). To the best of our knowledge, no study investigated the contribution of using music and massage therapies to pain management in third-line ICU in Turkey. The present study was conducted to meet the need for investigating the effect of using music and massage therapies on pain in the literature.

## METHODS

This is a randomized controlled prospective study conducted between January and July 2020 in the 26-bed third-stage gen-

**How to cite:** Elay G, Özkaya M. The Effect of Music and Massage on the Pain Scales and Vital Signs of ICU Patients with Hemodialysis Catheter. *Eur J Ther* 2020; 26(3): 263–9.

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**Received:** 20.07.2020 • **Accepted:** 29.07.2020



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eral ICU and 12-bed anesthesia ICU of the Training and Research Hospital. The study included 220 HD patients who were divided into four groups, and each patient was catheterized for HD. Power analysis was performed before the study. Musical and hand massage therapies were each applied to 58 patients, respectively. Music and received hand massage therapies were simultaneously applied to 56 patients. Furthermore, 50 patients were monitored without any extra treatment. Four types of methods were written on 220 pieces of papers. Subsequently, they were put in envelopes, and these envelopes were put into a box. We were blinded to the contents of the papers. In case of HD process, the patient's nurse picked one of the envelopes, and the method written was applied for the catheterization of the patient. The type of music was chosen by the patient if s/he was conscious; otherwise, the family members chose the type of music. Massages were performed by physiotherapists on duty in routine and in the ICU. Choosing the hand massage depends on factors, such as easy access to the hand of patient that has no venous or peripheral intravenous access. After checking the dermal integrity, hand massage was performed for 5 min on the right palm, and 5 min on the back of the hand. Subsequently, the same process was applied on the left hand.

HD catheterization was performed by the same specialist in the ICU unit. The vital signals of the patient were followed on the monitor and recorded. The pain scales were recorded by patient's nurse. The mean duration of catheter insertion was 35 min.

Sedation levels were evaluated using Richmond Agitation–Sedation Scale (RASS). The patients were administered paracetamol as analgesic, and propofol as sedative. Many scales are used for conscious and cooperative patients, with WONG as the easiest and most reliable (10). Ventilator-supported patients were evaluated using the Behavioral Pain Scale (BPS), a reliable scale composed of three subscales: upper extremity movements, facial expressions, and ventilation cooperation. These three subscales have four subscales (12 scales). A score of five indicates that the patient is in pain (11, 12). WONG and BPS were used for conscious and unconscious patients, respectively.

#### Inclusion Criteria

- ✓ Patients' age  $\geq 18$  years
- ✓ Patients without language or communication problems
- ✓ Patients expected to be in the ICU for  $\geq 72$  h
- ✓ Patients who agreed to participate
- ✓ Patients in need of urgent HD catheterization.

#### Main Points:

- Uncontrolled pain with any ICU patient may affect the course of medical applications negatively.
- Complementary use of music and massage on HD catheterized patients in ICU has contributed to improved vital signs and less pain along with more sedation.
- The study suggests adding music and hand massage therapy to nursing applications.

#### Exclusion Criteria

- ✓ Patients with hearing problems
- ✓ Patients with thrombus, hematoma, ecchymosis, phlebitis in the massage area, and those receiving anticoagulant infusion
- ✓ Patients hospitalized in the ICU for the second time during the study
- ✓ Patients already catheterized for HD
- ✓ Patients with thrombosis, local infections, and burns in the catheter area
- ✓ Patients with anatomic anomalies
- ✓ Patients with history of allergy to lidocaine, chlorhexidine, and povidone–iodine
- ✓ Patients (if the patient is unconscious the patient's relative) who refused to participate in the study.

#### Catheter Insertion

Femoral vein cannulation was performed using the Seldinger method (13). After placing the patient in the supine position, the leg was mildly abducted and externally rotated. Catheterization was performed on the side of the catheter. Femoral artery pulsation was performed 2–3 cm below the inguinal ligament, and the catheter was inserted through 1–1.5 cm medial of the area in  $45^\circ$  to the femoral vein. A guide wire was inserted (Figure 1). HD catheter was inserted through the guide wire. Each lumen of the catheter was checked for bleeding. In case of bleeding, the lumens were rinsed, and the catheter was fixed (Figure 2).

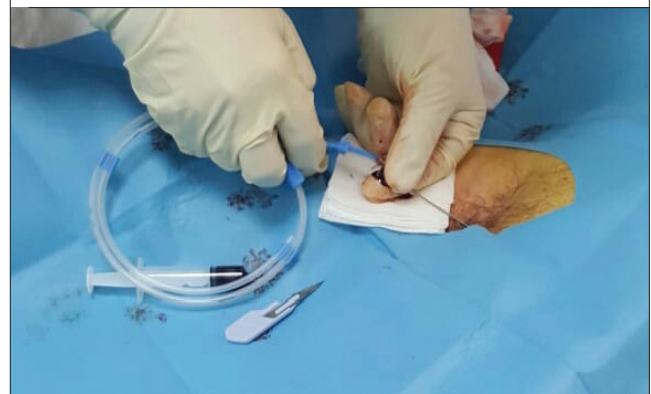
#### Ethical Considerations

Gaziantep University ethics Council approved this study (date: December, 25, 2019; reg. number: 2019/474). Written consents were obtained from conscious patients or from legal guardians of unconscious patients. Before the study, all participants and their relatives were briefed about catheterization and the complementary medicine methods in the study. They were also informed that they have the right to waive any time, and refusal of participation will not affect their treatment.

#### Statistical Analysis

Data were analyzed using frequency, percentage analysis, and complementary statistics. Moreover, Chi-squared analysis and T-test were used for categorical and continuous variables, re-

Figure 1. Central catheter insertion



**Table 1.** Demographic data

Variable	Total (n=222)
Age, mean (SD)	58.32 (18.67)
<b>Sex, n (%)</b>	
Male	148 (66.66)
Female	74 (33.33)
<b>Marital status, n (%)</b>	
Married	165 (74.32)
Single	57 (25.67)
<b>Education, n (%)</b>	
Primary school	72 (32.43)
High school	138 (62.16)
University	12 (5.40)
GCS mean (SD)	11.13 (4.01)
APACHE-II mean (SD)	19.57 (8.98)
<b>Intubation, n (%)</b>	
Intubated	69 (31.08)
Non-intubated	153 (68.91)
<b>Analgesic, n (%)</b>	
Yes	115 (51.80)
No	107 (48.19)
<b>Sedation, n (%)</b>	
Yes	32 (14.41)
No	190 (85.58)
RASS, mean (SD)	-1.46 (1.93)

GCS, Glasgow Coma Scale; APACHE, Acute Physiology and Chronic Health Evaluation; RASS, Richmond Agitation-Sedation Scale.

spectively. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) for Windows version 22.0 (IBM SPSS Corp.; Armonk, NY, USA). Significance was determined for  $p < 0.05$ .

**RESULTS**

The study included 220 patients, of which 148 (66.66%) were men, and 165 (74.32%) were married. The educational level of 72 (32.43%), 138 (62.16%), and 12 (5.40%) participants was primary school, high school, and university, respectively. Moreover, 32 (14.41%) patients were intubated, and 115 (51.80%) were administered analgesics, and 32 (14.41%) were administered sedatives. The mean Glasgow coma scale was  $11.13 \pm 4.01$ . The mean Acute Physiology and Chronic Health Evaluation 2 (APACHE-2) score was  $19.57 \pm 8.98$ . Meanwhile, the RASS scale was  $-1.46 \pm 1.93$  (Table 1). The demographical features of the subgroups were not

**Figure 2.** In case of bleeding, lumens were rinsed and the catheter was fixed



significantly different (Table 2). A statistically insignificant decrease was found in the systolic and diastolic BP after 90 min of music and massage (Mm) therapy group (respectively,  $p=0.056$ ,  $p=0.073$ ). The respiratory and heart rates of the Mm group was lower than baseline, which was statistically significant (respectively,  $p=0.027$ ,  $p=0.043$ ). A decline was observed in the BPS score of intubated patients in the only music and Mm groups (respectively,  $p=0.001$ ,  $p=0.000$ ). A significant decline in the WONG scale score of non-intubated patients in the only music, only massage, and Mm groups (respectively,  $p=0.000$ ,  $p=0.001$ ,  $p=0.000$ ). Despite no medical intervention received, the RASS score of Mm patients indicated more sedation ( $p=0.046$ ) (Table 3).

**DISCUSSION**

The study showed a significant improvement in pain scores and vital parameters in Mm group patients. This group had lower respiratory and heart rates than baseline. According to RASS, the combined effect of music and massage improved sedation. The BPS score of intubated patients and WONG scale score of non-intubated patients were significantly lower. Music has long been used as a complementary medicine method. The literature suggests that the effective period of music treatment is between 25 and 90 min (14). Therefore, for the current study, the use of music was limited to 30 min. Indeed, there was no exact consensus for the type of music used (6). It is well known that personal tastes play a role in choosing the right kind of music (15). Jasemi et al. (16) stated that making cancer patients listen to their favorite music significantly lowers the pain level. Regional characteristics, cultural and ethnic features along with personal tastes, and education have an effect on responses to the music people listen. There may be various responses to the same type of music. It may be correct that we have chosen the type of music in accordance with the personal tastes of our patients, and it revealed improvements in the treatment. Considering the pain scales of intubated and non-intubated patients, both values were lower and statistically significant (17). Music therapy has a physiological effect on lowering respiratory rate, arterial blood pressure, heart rate, and stress hormone responses (18). Chan et al. have made 66 patients, who were C-clamped after percutaneous coronary intervention, listen to music for 45 min, and the control group did not listen to any music. The heart rate, respiratory rate, and oxygen saturation levels of the music group were

**Table 2.** Demographic features of each group

Variable	Music (n=58)	Massage (n=58)	Music/massage (n=56)	Control (n=50)	p
Age, mean (SD)	57.88 (19.49)	58.47 (20.51)	56.47 (19.61)	59.37 (20.38)	0.324
<b>Sex, n (%)</b>					
Male	38 (65.52)	39 (67.24)	38 (67.85)	33 (66.00)	0.597
Female	20 (34.48)	19 (32.75)	18 (32.14)	17 (34.00)	0.590
<b>Marital status, n (%)</b>					
Married	43 (74.14)	43 (74.13)	42 (75.00)	37 (74.00)	0.475
Single	15 (25.86)	15 (25.86)	14 (25.00)	13 (26.00)	0.231
<b>Education, n (%)</b>					
Primary school	18 (31.03)	19 (32.75)	19 (33.92)	16 (32.00)	0.747
High school	37 (63.79)	35 (62.06)	34 (62.50)	32 (64.00)	0.591
University	3 (5.17)	4 (5.17)	3 (5.35)	2 (4.00)	0.440
GCS mean (SD)	11.05 (4.55)	11.53 (3.94)	11.40 (3.86)	11.00 (6.83)	0.367
APACHE-II mean (SD)	19.86 (9.94)	20.98 (8.89)	20.37 (7.92)	19.31 (8.02)	0.437
<b>Intubation, n (%)</b>					
Intubated	19 (32.76)	18 (31.03)	17 (30.35)	15 (30.00)	0.349
Non-intubated	39 (67.24)	40 (68.69)	39 (69.64)	35 (70.00)	0.124
<b>Analgesic, n (%)</b>					
Yes	31 (53.45)	30 (51.72)	29 (51.78)	25 (50)	0.766
No	27 (46.55)	28 (48.27)	27 (48.21)	25 (50)	0.584
<b>Sedation, n (%)</b>					
Yes	8 (13.79)	9 (15.51)	8 (14.28)	7 (14.00)	0.742
No	50 (86.21)	49 (84.48)	48 (85.71)	43 (86)	0.691
RASS, mean (SD)	-1.34 (1.78)	-1.54 (1.23)	-1.61 (1.12)	-1.29 (1.98)	0.657

GCS, Glasgow Coma Scale; APACHE, Acute Physiology and Chronic Health Evaluation; RASS, Richmond Agitation–Sedation Scale.

statistically significantly decreased compared with that of the control group (19). Besides perioperative applications, music therapy has been proven beneficial for many procedures, such as bronchoscopy, pleural drainage, and central venous catheter insertion (20). Catheter insertion is one of the most painful procedures applied in the ICU. Many HD patients are admitted to medical ICUs, and they need urgent HD treatment. Pain management may be difficult during this non-elective procedure. Using painkillers at high doses may be harmful for patients with organ dysfunctions. Complementary medical methods, such as music and massage therapies, are easy to apply and inexpensive compared with their positive effects. Zengin et al. have made one part of 100 cancer patients listen to music during port catheter insertion. Following the procedure, serum cortisol, ACTH levels, and blood pressure of the two groups were compared. The hormone level, respiratory rate, blood pressure, and pain scores of the music group were lower than those of the control

group (21). The present study did not focus on cortisol or ACTH levels due to loss of diurnal rhythm in the ICU. In addition, the cortisol levels of HD patients are expected to be above normal levels because some patients will have multiorgan dysfunction, respiratory failure, or hypotensive shock. ICUs are departments where vital signs are the most important, and many painful procedures are performed. Thus, many studies suggest the application of music therapies in nursing (6). Music therapy is widely used in cardiology departments. Twenty-three studies on 1461 patients have shown that music therapy lowers the blood pressure and heart and respiratory rates (22). Besides conscious patients, unconscious patients also benefit from music therapy, especially in the ICU. Ajri et al. (23) stated that music therapy decreases the pain score of unconscious patients. Fariba et al. (24) showed that when unconscious and ventilator-supported patients listen to music for three consecutive days, pain control is easily achieved at the end of the third day. Music therapy was

**Table 3.** Vital signs and pain scales

Variables (SD, min–max)	Before catheterization 30 dk	Catheterization 30 dk	Catheterization 30–60 dk	p
<b>Systolic blood pressure (mmHg)</b>				
Normal	128.55±19.65	127.88±17.89	126.95±17.35	0.409
Music	126.64±24.29	128.00±23.15	124.72±25.52	0.249
Massage	125.93±22.31	124.88±21.62	123.03±22.00	0.327
Music and massage	130.53±23.79	128.43±21.59	127.33±21.87	0.056
<b>Diastolic blood pressure (mmHg)</b>				
Normal	74.91±14.43	75.71±13.57	75.64±13.82	0.737
Music	75.43±18.34	74.52±17.67	74.36±18.1	0.590
Massage	71.33±14.19	71.31±11.95	71.66±13.19	0.914
Music and massage	73.83±14.72	71.62±15.21	71.34±13.88	0.073
<b>Respiratory rate (cycles/min)</b>				
Normal	19.59±4.63	19.64±4.43	19.31±4.57	0.708
Music	19.47±5.09	19.72±5.12	19.84±4.46	0.735
Massage	20.10±5.48	20.17±5.25	19.79±5.28	0.735
Music and massage	20.33±5.11	19.55±4.87	18.98±5.01	0.027
<b>Heart rate (bpm)</b>				
Normal	94.28±18.19	94.95±18.24	93.02±17.08	0.155
Music	95.12±3.13	95.12±3.59	95.00±3.52	0.828
Massage	94.45±2.86	94.55±2.87	94.74±2.67	0.341
Music and massage	95.60±16.11	94.26±15.69	93.71±16.45	0.043
<b>Oxygen saturation (%)</b>				
Normal	94.16±3.21	94.50±3.26	94.52±3.25	0.235
Music	94.72±2.73	94.71±2.44	94.91±2.62	0.584
Massage	94.52±15.60	93.76±14.63	93.05±15.28	0.239
Music and massage	95.38±2.63	95.48±3.10	95.43±2.95	0.916
<b>RASS (median)</b>				
Normal	–1.31 (1.88)	–1.29 (1.78)	–1.28 (1.85)	0.923
Music	–1.32 (1.71)	–1.30 (1.77)	–1.31 (1.74)	0.874
Massage	–1.47 (1.23)	–1.49 (1.24)	–1.42 (1.19)	0.432
Music and massage	–1.41 (1.46)	–1.52 (1.39)	–1.66 (1.92)	0.046
<b>BPS</b>				
Normal	3 (1.00–3.75)	3 (1.00–3.75)	3 (1.00–3.75)	0.097
Music	3 (1.25–3.75)	2 (1.00–3.75)	1 (1.00–2.75)	0.001
Massage	3 (1.00–3.00)	3 (1.00–3.00)	3 (1.00–3.00)	0.223
Music and massage	3 (2.000–5.000)	3 (1.000–5.000)	3 (0–5.000)	0.000
<b>WONG scale</b>				
Normal	1 (0–2.00)	1 (0–2.00)	1 (0–2.00)	0.368
Music	2 (2.00–2.00)	2 (1.00–2.00)	1 (1.00–2.00)	0.000
Massage	2 (1.000–2.000)	2 (0–2.000)	1 (0–2.000)	0.001
Music and massage	2 (2.00–3.00)	2 (1.00–2.00)	2 (1.00–2.00)	0.000

RASS, Richmond Agitation–Sedation Scale; BPS, Behavioral Pain Scale; WONG, Wong–Baker faces pain rating scale.

shown to decrease anxiety and the need for sedatives in mechanical ventilator-supported patients (25). The present study did not include the data of sedative need as music and massage therapies were applied only during catheter insertions. Local anesthesia was applied on the catheter insertion area, and this process continued without any extra sedation if the patient received routine sedation. The relationship between consecutive application of music or massage therapy for several days and the need for sedation may be revealed through future studies. The PADIS guideline suggests the use of music and massage therapies in ICUs. Five randomized controlled studies stated that the pain scores were significantly reduced when massage therapy was applied for 30 min. These studies utilized hand, foot, and body massages. These were included as suggestions in the guideline because massages reduce the need for opioids. However, studies on this subject are lacking (5). Massage and music therapy have long been used since ancient times (8). Hajbaghery et al. (26) stated that anxiety, diastolic blood pressure, and heart and respiratory rates were significantly reduced after applying full-body massage therapy for 60 min on ICU patients compared with the control group. Meanwhile, Vibhu et al. conducted a study on 104 cardiac surgery patients who were made to listen to music postoperatively on the first day. The patients received a mild massage therapy before room transfer. The massage group reported a significant decrease in pain compared with the control group (27). The present study utilized massage and music therapies on different days. Thus, there is no evidence on whether they have a combined effect. Music and massage therapies were applied on the same type of patients in this study. Having four different groups, having different personnel for insertion and records, and having no idea about the method applied on each patient make the study valuable. In addition, application of the combined therapy in one of the groups and possible determination of the combined effect of therapies make it more valuable. Hand massage therapy is important in terms of accessibility. It can be applied without risking the sterility of the patient during catheterization. Similar to the present study, Boitor et al. (28) stated that hand massage therapy improved the vital signs and reduced the pain score. To the best of our knowledge, this is the first study investigating the contribution of using music and massage therapies to pain management in a third-line ICU in Turkey. However, the study has some limitations.

### Limitations

Even if the study was conducted in two different ICUs, they were in the same medical center. Therefore, the findings cannot be generalized. The study may be conducted on a wider patient group in multiple centers because the anxiety of the patient may be due to his/her acute HD need, and it may improve with dialysis process. It is speculated that patients may not respond to our tests because most of them were in respiratory distress. Furthermore, it is speculated that the anxiety levels of patients may not be evaluated correctly because some of the patients were intubated, and some of them were sedated. The conscious subgroup should be evaluated for anxiety levels, but the number of patients was not sufficient. Anxiety can be assessed in larger patient subgroups.

## CONCLUSION

Complementary use of music and massage on HD catheterized patients in the ICU has contributed to improved vital signs and less pain along with more sedation. The study suggests adding music and hand massage therapy to nursing applications.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the Ethics Committee of Gaziantep University (date: December, 25, 2019; reg. number: 2019/474).

**Informed Consent:** Written consents were obtained from conscious patients or from legal guardians of unconscious patients.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept - G.E.; Design G.E., M.Ö.; Supervision - G.E.; Resources - G.E.; Materials - M.Ö.; Data Collection and/or Processing - G.E.; Analysis and/or Interpretation - G.E.; Literature Search - G.E.; Writing Manuscript - G.E.; Critical Review - M.Ö.; Other - G.E., M.Ö.

**Conflict of Interest:** The authors have no conflicts of interest to declare.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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