



ORIGINAL ARTICLE

Designed sound and music environment in postanaesthesia care units—a multicentre study of patients and staff

Per Thorgaard^{a,*}, Ellen Ertmann^a, Vibeke Hansen^a, Anni Noerregaard^b, Vibeke Hansen^b, Lene Spanggaard^c

^a Department of Anaesthesia and Intensive Care, Aalborg Sygehus, Aarhus University Hospital, DK-9100 Aalborg, Denmark

^b Department of Anaesthesia and Intensive Care, Odense University Hospital, Denmark

^c Department of Anaesthesia and Intensive Care, Skejby Sygehus, Aarhus University Hospital, Denmark

Accepted 28 October 2004

KEYWORDS

Music;
Postanaesthesia care;
Creative arts therapies;
Alternative therapies;
Multicentre study

Summary A multicentre study in five postanaesthesia care units (PACUs) was performed to investigate patient and staff opinion of a specially designed music environment (DME), related to geographical location. Patients (325) and staff (91) described their opinion by means of a questionnaire—anonously in the case of staff. Patients were not asked beforehand for permission to play music.

Amongst patients 267 (83%) found the sound environment with DME pleasant or very pleasant, 26 (6%) found it unpleasant, whereas 32 (11%) answered “no opinion”. The opinion of the patients did not differ significantly with geographical location. A strong correlation ($P < 0.05$) between a positive attitude towards DME and degree of relaxation and satisfaction with stay was found. The staff had an equally positive attitude towards the DME; but theirs varied significantly with location. The opinion of the staff was more similar concerning the beneficial effect on working conditions and distress, but varied still significantly. The opinion of the staff had no demonstrable impact on that of the patients.

© 2004 Elsevier Ltd. All rights reserved.

Introduction

The effect of music on patients in a hospital environment has been documented in several studies.

Recently, Evans (2002a) reviewed previous randomized trials evaluating the effectiveness of recorded music compared with a control intervention on adult patients in a hospital setting. It was concluded “music as a single session intervention reduces anxiety and respiratory rate in patients admitted to hospital”. Thus, the effect of music in patient envi-

* Corresponding author. Tel.: +45 99 32 1061.
E-mail address: U19086@an.nja.dk (P. Thorgaard).

ronments is apparent, but many aspects in relation to the administration of music in a hospital environment are unclear. Amongst these is the impact on patients of the nursing staffs opinion in relation to the music played in the room.

In this multicentre trial we evaluated the effect of new music specially designed for the purpose, played through ceiling-suspended loudspeakers, on patients recovering after anaesthesia in five wards at three University Hospitals in Denmark. The study was focused on the patients' opinion of the music environment and the opinion of the staff. Thus, we have tried to elucidate whether positive or negative opinions of the staff could induce changes in the patient related effect of the music. Additionally we investigated whether these were geographically related differences with respect to staff opinion and patient effect.

Methods

Five postanesthesia care units (PACUs) participated in the study. These were designated North, South, Skejby, COPA and VITA and were located at three Danish University Hospitals (Aalborg University Hospital (North and South), Skejby University Hospital (Skejby) and Odense University Hospital (COPA and VITA)). Data were collected by means of questionnaires—completed by patients and staff. Nurses specifically trained in how and when to question the patients questioned the patients at the end of their stay in the PACU. Due to the multicentre design of the study, it was necessary to use different interviewers in the participating PACUs—two at each PACU. They were all personally instructed in a strict and uniform interview technique. The staff were asked to complete a questionnaire at the end of the investigation period. The staff questionnaire was delivered by mail accompanied by a personal letter describing the context and the importance of replying to the investigation group. The questions to staff and patients were standardized according to the protocol, which was approved by the local Ethical Committee. Consent was not required from patients or staff. The patients were not informed in any way before or after the anaesthesia and operation. This was acceptable according to the local Ethical Committee, who considered the project to be a quality management project (quality evaluation of the sound environment). Thus, the patients were “blind” with respect to their participation in the investigation. Patient opinion was both expressed qualitatively (by choosing specified statements)—and quantitatively (as numbers on a 10-item Likert Scale, (0) being the “best think-

able” and (9) being the “worst thinkable”). Staff opinion was only expressed qualitatively. The study was performed by some of the members of Musica Humana—a Danish non-profit organization dedicated to improve the sound environment in hospitals. Support from Musica Humana was provided as access to a web-based database, which facilitated data input from the geographically dispersed test sites.

The questions to the patients focused on the following items:

- (1) Patient's opinion of the music sound environment (“pleasant”/“unpleasant”/“no opinion”) and rating of their opinion on a 10-item Likert Scale.
- (2) Their degree of relaxation and their satisfaction with the PACU-stay—both parameters expressed on a 10-item Likert Scale.

The questions to the staff focused on the following items:

- (1) What is your personal opinion of the music sound environment (“pleasant”/“unpleasant”/“no opinion”)?
- (2) How does the music affect your working conditions (“increases stress”/“diminishes stress”/“no opinion”)?
- (3) How does the music environment affect the total level of sound in the room (“increase”/“decrease”/“unchanged”)?
- (4) How do you think the music sound environment is experienced by the patients (“positively”/“negatively”/“no opinion”)?

The staff received a questionnaire with an accompanying letter in their “pigeon holes”. In this letter they were encouraged to complete the questionnaire, which was described as an integral part of the study. We did not repeat our contact with the staff. The leaders of the PACUs were instructed to give the same information to the participating staff (written information to each—and information at one staff-meeting).

The patients were all recovering after operations performed under general anaesthesia or regional analgesia (with or without sedation). No intervention concerning the type of anaesthetic chosen was performed in relation to the investigation. The patients were not asked beforehand for permission to play music nor were they notified about the presence of music in the room. On specified days consecutive patients were included if they were over the age of 18 years, had normal hearing (defined as: “did not use artificial hearing aid”) and spoke Danish.

The specially designed music was played through ceiling-suspended loudspeakers “on top” of the basic sounds in the room. Thus, the usual sounds in the PACUs were not changed for the investigation. The music sound level was fixed at just audible. The sound level (volume) was not altered in relation to the music or to the basic sounds in the room quantified in dB. Noise and music sound level measurements were actually performed in the preparation phase of the study; but as the volume of music and noise varied very much during the investigation period (from minute to minute) it was difficult to make a representative expression of this parameter. Furthermore, it was the sound volume perceived by the patient and the staff-members that was of highest interest—and we were not able to measure and express that parameter in a meaningful way. Niels Eje—a Danish composer, composed the music for the investigation. The music consisted of a series of CDs, which were played in a specified order during the day. Thus, not all patients listened to the same music, but all listened to the same type of music.

The staff sample comprised nurses taking care of the patients in the PACUs during the investigation period. Not all experienced the same amount of working time with the music environment, but all experienced more than 3 working days with it.

Statistical methods

Nonparametric methods were used. Comparison between groups was made by the Mann–Whitney test. The Spearman rank correlation coefficient was used to measure the association between variables at a given test site. Analysis of variance between the test sites of a given variable was made by the Friedman test as modified by Conover (1980) for pairwise comparison if an overall difference was found. A 5% level (two-tailed) of statistical significance was used.

Results

A total of 329 patients were included, but 4 patients were not questioned due to complications during the recovery period (severe myocardial ischemia in 1 patient and bleeding complications in 3 patients). The remaining patient group consisted of 325 patients (149 men and 176 women). Asked about their opinion on the sound environment, 267 (83%) found it “pleasant”, 26 (6%) found it “unpleasant” and 32 (11%) answered “no opinion”. The distribution

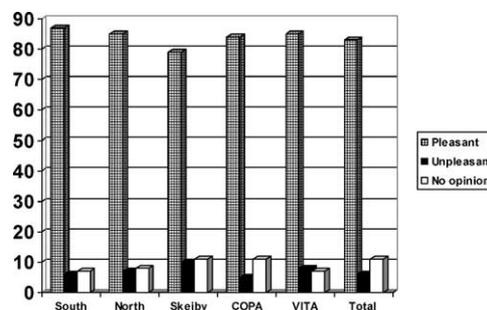


Figure 1 The distribution of the patient opinions of designed music environment (%) related to the five recovery wards and of the total number of participating patients (“total”).

of the patient opinions (given in percentage) related to the five recovery wards and that of all the patients is given in Fig. 1. The patients had very similar opinions in all the participating wards—without demonstrable statistical differences. We did not find any differences in patient opinion related to sex, age or type of anaesthesia chosen for the operative procedure.

The patient median Likert Scale rating of *degree of relaxation* and of *satisfaction with the stay at the PACU* was 3.05 and 1.38, respectively.

When related to the patients’ opinion of the sound environment, this relaxation and satisfaction score varied significantly. The median Likert Scale ratings of the degree of relaxation in relation to the opinion “pleasant”, “unpleasant”, “don’t know” respectively were 2.39, 6.58 and 4.06. The median Likert Scale ratings in relation to overall satisfaction with the PACU-stay related to the sound environment opinion “pleasant”, “unpleasant”, “don’t know” were 0.96, 3.11 and 1.03, respectively (Fig. 2). There was a significant correlation between the median Likert Scale ratings and the patients expressed opinion of the music sound environment as “pleasant”/“unpleasant”/“no opinion”.

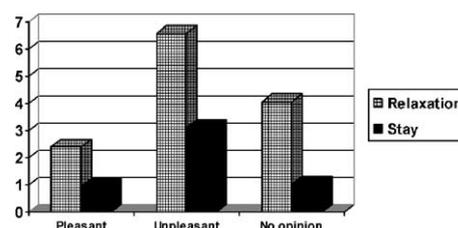


Figure 2 Median Likert Scale rating of the degree of relaxation in relation to the patient opinion on music sound environment (“pleasant”/“unpleasant”/“no opinion”, respectively) and a similar plot of the median Likert Scale rating in relation to their satisfaction with the PACU-stay.

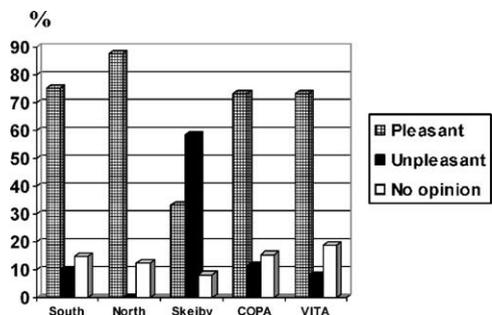


Figure 3 The staffs were asked about their opinion of the sound environment (“pleasant”/“unpleasant”/“no opinion”). There was a significant difference with respect to the results in the five PACUs. Four wards had very similar results; whereas the fifth with regard to this question had a significantly ($P < 0.05$) more negative opinion.

All staff serving in the PACUs during the investigation were asked to fill in a questionnaire at the end of the investigation period. We forwarded 138 questionnaires—of which 91 were returned with complete answers. The staff opinions of the sound environment (“pleasant”/“unpleasant”/“no opinion”) were 63 (70%), 14 (15%) and 14 (15%), respectively. There was a significant difference with respect to the results in the five PACUs. Four wards had similar results; whereas the fifth in regard to this question had a significantly ($P < 0.05$) more negative opinion of the music sound environment (Fig. 3).

The staff were asked whether the music sound environment induced a less or more distressing working condition. The overall results were: “Diminished stress” in 62 (69%), “increased stress” in 15 (16%) whereas 14 (15%) had “no opinion”. Again we observed a significant variation in relation to the geographical origin of the answers (Fig. 4). The same four PACUs had similar an-

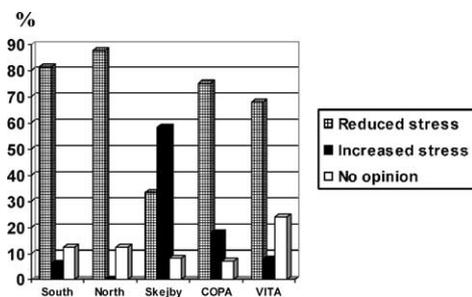


Figure 4 The staffs were asked whether the music sound environment induced a less or more distressing working condition. We observed a significant variation in relation to the geographical origin of the answers. Four PACUs had similar answers, whereas as the fifth differed significantly ($P < 0.05$).

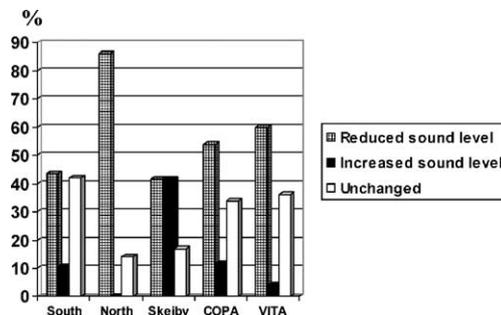


Figure 5 Results related to the geographic origin of answers to the question: “How does the music environment affect the total level of sounds in the room (“decrease”/“increase”/“unchanged”)?”

swers, whereas as the fifth differed significantly ($P < 0.05$).

In relation to the question: “How does the music environment affect the total level of sounds in the room (“decrease”/“increase”/“unchanged”)?” 50 persons (55%) thought the music sound environment decreased the total sound level. Twelve persons (13%) thought there was an increased sound level due to DME, whereas 29 persons (32%) observed “no change”. The results related to the various geographical locations are given in Fig. 5. There was a statistically significant difference between North and the rest of the PACUs—as the North-staff more frequently described a reduced sound level in the room than staff on the other test sites.

Finally the staff were asked: “How do you think the music sound environment is experienced by the patients (“positively”/“negatively”/“no opinion”)?” The overall answers were: 65 persons (70%) believed that the patient positively experienced the music sound environment, 8 persons (10%) believed it was a negative patient experience, whereas 18 persons (20%) answered “no opin-

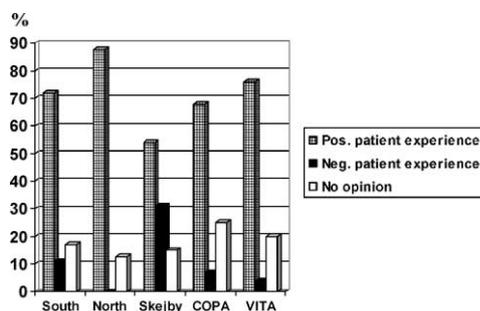


Figure 6 The staffs were asked: “How do you think the music sound environment is experienced by the patients (“positively”/“negatively”/“no opinion”)?” Results related to the five individual PACUs did not vary significantly.

ion". Results related to the five individual PACUs are given in Fig. 6. There was no statistically significant difference between the answers from the various test sites in relation to this question.

Discussion

The positive effect of a music sound environment on hospitalized patients has previously been demonstrated (Evans, 2002b; Heitz et al., 1992; Tusek et al., 1999; Nilsson et al., 2003). The positive attitude of our patients towards music in the recovery room was thus not surprising. Although it was not the primary aim of our study, we found it of interest to investigate a possible relationship between patient satisfaction with music sound environment and degree of relaxation and satisfaction with stay in the department. Our findings did indicate that there is such a relationship, as there was a significant correlation between satisfaction with music sound environment (expressed as "pleasant"/"unpleasant"/"no opinion") and "degree of relaxation" and "satisfaction with stay" (expressed as median Likert Scale ratings). However, our results should not be interpreted as definitive. They may indicate – but do not prove – a causal relationship between these circumstances – as both the Likert Scale ratings and the evaluation of the music sound environment may be influenced by a third factor. Current studies are being designed to elucidate this matter.

In this study DME was added to the usual sound environment of PACUs. Thus, the loudness of sounds in the ward was probably increased. Nevertheless, the majority of staff-members experienced a reduced sound level and a less distressing environment. Others (Schertzer and Keck, 2001; Kam et al., 1994) have combined the use of music in PACUs with a deliberate reduction of other sounds by keeping extraneous noise at a minimum. It seems from our results that an effect is achieved by using DME without taking other measures. It is however unclear whether the use of DME in itself reduced the noise level at the participating wards by an "automatic" change in behaviour of the staff. Likewise, it is unclear whether posing restrictions on noisy behaviour of the staff and reducing other noise would have achieved an increased effect of DME.

We had in our investigation chosen to question the staff participating in the study by means of a questionnaire, which was anonymously returned. We avoided a direct personal interview with each staff-member in order to avoid possible bias related to this type of interview in favour of a positive at-

titude towards the music sound environment. Unfortunately, this study design weakened our results concerning the opinion of the staff, as a relatively high number of persons did not deliver completed questionnaires. Nevertheless, the staff responses of the five recovery wards varied significantly. Four of the wards had similar results concerning staff – but one was significantly different. All used the same music in the same order delivered by ceiling-suspended loudspeakers and with similar loudness. All wards had a leader with a positive attitude towards the project, who introduced the concept to the staff. Thus, the introduction was performed by various persons but in a similar way – and the same music was used in the same way at all test sites. A positive attitude towards music sound environment amongst staff has previously been described (Neuhof et al., 1980). However, our results show that the subjective opinion of staff-members concerning the music sound environment and its impact on working conditions are highly determined by factors other than the quality of music. Thus, using the music sound environment as a positive factor for staff requires more effort than just choosing the "right" music. Our study design does not allow further conclusions to be drawn concerning this item. However, we find it of great importance that the majority of staff had a positive experience of the music sound environment. Otherwise this important tool, to improve patient comfort and satisfaction, will not be used as frequently as the patient sample indicated would be beneficial.

Another finding in our study was that the subjective (negative) opinion of staff did not have an impact on the patients. Recovery ward patients are slowly returning to consciousness and seldom have a dialogue with staff during their stay. Our results may therefore not be surprising. In other patient groups where the contact between staff and patients are longer and dialogue based, one would expect that staff attitude does influence that of the patients. Another explanation could be that music by its own nature is a very subjective phenomenon (Heitz et al., 1992). In patients with distorted perception of stimuli – such as recovery ward and sedated patients – the sound impressions from the environment are perceived differently in patients compared with staff. A different perception decreases the likelihood of getting the same opinion on the subject in question – in this case the music sound environment.

The especially composed music used in this investigation was designed for the PACU patients. The Danish composer Niels Eje created a programme based on a number of fundamental ideas within certain rhythm patterns, harmonic and melodic struc-

tures, three-dimensional production principles and a carefully specified dynamic range. The compositions are often based on the sounds of nature combined with soft instrumentation (harp, cello, oboe, voices and synthesizers). There are no national or international recommendations concerning the right type of music to a specific therapeutic procedure or situation, but it has been recommended that "music" is used as a tool to reduce anxiety in hospitalized patients (Evans, 2002a; White, 2002). The dilemma of choosing music for patients has, in many hospitals, lead to individualized music sound environment based on the personal wishes of each patient (White, 2000; Bolwerk, 1990; Smolen et al., 2002). Niels Eje has a different philosophy regarding the use of the music sound environment in hospitals. He argues that patients are not able to choose the right type of music as they are unaware of their mental state and the specific situation they experience during the therapeutic procedure in question. Previous Danish studies (Toerring, 2001; Thorgaard et al., 2004) have shown that only 40% of patients expressed a positive wish to hear music during a specific procedure when asked beforehand. On the other hand, the patient experience with a specially designed sound environment was positive in more than 80% of the patients—when they were not asked beforehand for permission to play music (Thorgaard et al., 2004; Toerring, 2001).

Future studies are needed to clarify the important question of whether a certain type of music should be selected for a certain therapeutic procedure or clinical situation. Likewise, whether the choice of music environment should be based on the individual patient's wish—or should be part of a documented therapeutic strategy.

Conclusions

This multicentre study showed a good – and geographically uniform – patient satisfaction with a designed sound environment superimposed on the basic sounds of the participating PACUs. Patient experience expressed as degree of relaxation and satisfaction with stay at the PACU was positively correlated with their like or dislike of the sound envi-

ronment. The specific type of music was overall a positive factor for the staff with respect to working conditions, but varied significantly with location. A negative opinion of the staff concerning music sound environment had no demonstrable impact on that of the patients.

References

- Bolwerk C. Effects of relaxing music on state anxiety in myocardial infarction patients. *Crit Care Nurs Q* 1990;13(2):63–72.
- Conover WJ. *Practical nonparametric statistics*. 2nd ed. New York: John Wiley & Sons; 1980.
- Evans D. Music as a single session intervention reduces anxiety and respiratory rate in patients admitted to hospital. *Evidence Based Nurs* 2002a;5:86.
- Evans D. The effectiveness of music as an intervention for hospital patients: a systematic review. *J Adv Nurs* 2002b;37(1):8–18.
- Heitz L, Symreng T, Scamman FL. Effect of music therapy in the postanesthesia care unit: a nursing intervention. *J Post Anesth Nurse* 1992;7:22–31.
- Kam PCA, Kam AC, Thompson JF. Noise pollution in the anesthetic and intensive care environment. *Anesthesiology* 1994;49:982–6.
- Neuhof H, Klapp BF, Gerlach O, Kock HU, Hundhausen T, Lasch HG. Die Wirkung von "Entspannungsmusik" auf Patienten, Ärzte und Pflegepersonal einer internistischen Intensivstation. *Deutsche Medizinische Wochenschrift* 1980;105:556–60.
- Nilsson U, Rawal N, Enqvist B, Unosson M. Analgesia following music and therapeutic suggestions in the PACU in ambulatory surgery; a randomized controlled trial. *Acta Anaesthesiol Scand* 2003;47:278–83.
- Schertzer K, Keck E. Music and the PACU environment. *J Peri Anesth Nurs* 2001;16(2):90–102.
- Smolen D, Topp R, Singer L. The effect of self-selected music during colonoscopy on anxiety, heart rate, and blood pressure. *Appl Nurs Res* 2002;15(3):126–36.
- Thorgaard B, Pedersbaek G, Henriksen B, Thomsen I. Specially selected music in the Cardiac Laboratory—an important tool for improvement of the well-being of patients. *Eur J Cardiovasc Nurs* 2004;3:21–6.
- Toerring B. Patienter kan lide at vågne til musik. *Sygeplejersken* 2001;38:30–3.
- Tusek DL, Cwynar R, Cosgrove DM. Effect of guided imagery on length of stay, pain and anxiety in cardiac surgery patients. *J Cardiovasc Manag* 1999;10:22–8.
- White J. Music therapy: an intervention to reduce anxiety in the myocardial infarction patient. *Clin Nurse Spec* 2002;6(2):58–63.
- White J. State of the science of music interventions. *Crit Care Nurs Clin N Am* 2000;12(2):219–25.

Available online at www.sciencedirect.com

