



KEY POINT SUMMARY

OBJECTIVES

To determine whether self-rated levels of anxiety in ED patients are affected by exposure to sound compositions or purpose-designated music with and without embedded binaural beats.

Original sound compositions reduce anxiety in emergency department patients: A randomised controlled trial

Weiland, T., Jelinek, G., Macarow, K., Samartzis, P., Brown, D., Grierson, E., Winter, C. 2011 | *Medical Journal of Australia*. Volume 11, Issue 195, Pages 694-698

Key Concepts/Context

Patients being treated in emergency departments (EDs) might experience anxiety during their stay. The beneficial effect of music on anxiety has been well demonstrated in previous studies, but no previous study has investigated the potential anxiety-reducing effects of sound interventions or the use of binaural beats among adult ED patients. Binaural beats are sounds that are perceived independent of physical stimuli; when two sounds of similar yet slightly different frequencies are played individually between two ears, both the sum and difference between the frequencies are experienced. Audio using binaural beats has been associated with reduced preoperative anxiety and further, binaural beats may reduce chronic anxiety by inducing a state similar to meditation.

Methods

291 ED patients were assessed for eligibility in the study. Participants had to be 18 years or older and had to be ranked as a category 3 on the Australasian Triage Scale (ATS), meaning the patients displayed acuity levels indicating the need for medical assessment within 30 minutes. 170 qualified patients provided consent and completed a baseline anxiety self-assessment.

Patient anxiety levels were self-reported through the Spielberger State-Trait Anxiety Inventory (STAI), which is a 40-item measure containing 20 items for state anxiety (anxiety experienced at the moment) and 20 other items for trait anxiety (usual level of anxiety). Scores for both state and trait sections ranged from 20 to 80, with higher scores indicating higher anxiety levels. An STAI assessment was made after initial medical assessments.

Four 20-minute sound recordings were created at an Australian university for the study. These included: an electroacoustic musical composition, a composition



DESIGN IMPLICATIONS

The use of sound-cancelling headphones may have additional utility for patients in emergency departments, as the noises inherent in the busy environment may be jarring and anxiety inducing.

The use of individual audio players could give patients an added sense of security while preventing even more noise from entering the ED. Soundproofing within designated rooms in the ED could be considered to further minimize anxiety induced by noise.

featuring field recordings of natural and constructed settings, a composition featuring field recordings obtained from natural settings embedded with binaural beat, and an ambient soundtrack reconstructing ED sound effects without talking.

The binaural beat was added into the field recording track using two digital sine-tone generators at 200

Hz and 210 Hz. In order to change the depth of the meditative state, the interval between generators was lessened by 2 Hz during the course of the composition until a 4 Hz frequency differential was reached, then a gradual increase to 10 Hz was implemented in the composition's final movement.

Audio interventions were administered through headphones attached to an iPod. The headphone model used was an AKG k121 studio by Harman International. Disposable sanitary covers were used for the headphones and both the headphones and iPod were cleaned with alcohol.

Regardless of listening duration, a second STAI test was administered 20 minutes after patients underwent their audio interventions.

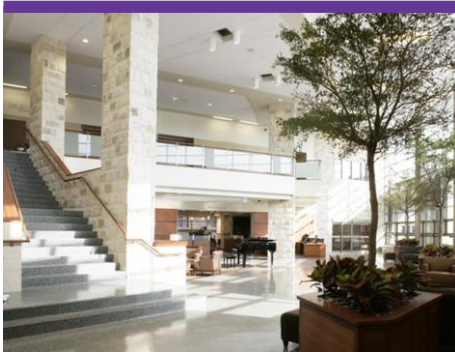
Participants were divided into five groups with 34 people in each of the following groups: headphones with no sound, ED noise reconstruction, electroacoustic musical composition, field recordings, and combination field recordings with binaural beat. Researchers and participants were blinded as to who would listen to what recording until the interventions were administered.

Staff were told to interrupt patients who were listening to music whenever necessary.

Data was analyzed using repeated measures analysis of variance (ANOVA) in order to determine changes in anxiety from a baseline within each group. Univariate ANOVA was used for comparing anxiety levels for each group after accounting for baseline differences.

Findings

Normal state anxiety ranged between 38.9 and 43.7 on the STAI for all patients, and dropped to a range of 33.7 and 36.9 in groups who heard electroacoustic music, field recordings, and field recordings infused with binaural beat. Mean trait anxiety did not differ noticeably between any patient groups and ranged from moderate to low. The control group and the group that listened to simulated ED sounds both remained moderately anxious once the intervention was over. Binaural beat did not significantly reduce anxiety over the field recordings alone, suggesting that binaural beat may be less effective in a busy ED environment.



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Limitations

Only ATS category 3 patients were allowed to participate, meaning these results might not generally apply to all ED patients, especially those with more severe illnesses, injuries, or levels of anxiety. While the STAI is an effective patient-reported measure of anxiety, further tests could have been done to gather data on physiological indicators of anxiety reduction.

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