Effect of music on pain during wound closure

Clément Duroux, Manon Fainelli, Zidane Dirhoussi, Alexandre Le Joncour, Colombine Bonier, Cathia Zak, Raphael Cornet, Pierre-alexis Raynal, Youri Yordanov, Pierre-clément Thiebaud

Effect of music on pain and anxiety during wound closure in the emergency department

Skin wounds account for about 5% of emergency department (ED) visits and may cause pain and anxiety, related to the trauma and/or the therapeutic procedure.[1] Wound closure by stitches, the most commonly used technique, is potentially painful. French guidelines on pain management in the ED suggest using music as a non-pharmacologic analgesic procedure. In a meta-analysis on the analgesic efficacy of music, authors reported a significant reduction in postoperative pain and morphine consumption.[2] Few studies on music therapy have been conducted in the ED and with various methods.[3-6] Only one study assessed the usefulness of music during wound closure in adults in the ED.[7] The mean pain intensity was significantly lower in the music group than in the controls and anxiety scores were similar. We aimed to assess whether the implementation of a music protocol during wound closure in the ED could reduce the pain and anxiety experienced by patients, compared to usual care.

This was a single-center, quasi-experimental, before/after controlled study, performed from June 29, 2020 to December 10, 2020 in an urban university hospital ED. The study protocol was approved by the greater Paris Area Ethics Committee (*Comité de Protection des Personnes Ile-de-France*) and registered on Clinicaltrials.gov, NCT04426110. All patients older than 18 years presenting to the ED with an acute traumatic wound and an indication for stitches were eligible. Non-inclusion criteria were: the inability to understand the information provided, give consent or reliably assess pain due to a language barrier, acute intoxication, neuro-psychiatric pathology or significant hearing impairment; suspected open fracture or wound requiring surgical exploration; wound located on or around the ear not allowing headphones to be placed; refusal to participate. Verbal consent was obtained before inclusion. During the “before” period, standard of care was applied. During the "after” period, the intervention was the implementation of a music protocol during wound closure. Patients were invited to choose a playlist among five proposals created by a professional music therapist: vocal jazz, instrumental jazz, piano, world music or Mozart. Music was listened to through high quality wireless headphones (JBL®, Live 650 BTNC). No other changes in patient’s management were added by the research. Pain and anxiety score were both measured with a 100 mm visual analog scale (VAS), just prior to suturing and immediately after the end of the procedure. Additionally, patients were asked to rate the maximum intensity of pain and anxiety experienced during the procedure. Other collected data were age, sex, wounds characteristics (size, location), and details of the suture (operator, type of anesthesia, thread size, number of stitches, duration). The primary endpoint was the maximum pain intensity

during the intervention. Secondary endpoints were intensity of pain and anxiety at the end of the procedure and maximum anxiety during the procedure. Our hypothesis was that music could reduce pain by 10 mm on the VAS, the minimal difference we considered as clinically relevant for a baseline pain score <40 mm.[8] Given the mean standard deviation of 20.1 mm found in the similar study by Menegazzi et al,[7] calculations indicated that a sample of 65 patients per group would have 80% power to detect a minimum clinical difference in pain scores of 10 mm, with a significance level of alpha=0.05. Considering a possible data loss of 10%, we planned to include 72 patients in each group, for a total of 144 patients. Qualitative data were reported as number and proportions, and compared using the Chi-square test. Quantitative data were reported as medians with interquartile ranges (IQR) and compared with the Wilcoxon test. All analysis were performed with the R software (version 3.6.2).

From June to December 2020, 144 patients consented to participate. Median age was 38 [IQR 28-55.5] and 86 (59.7%) were men. Baseline characteristics of patients were similar between the two groups, including VAS pain and anxiety scores before suturing procedure (Table 1). Facial wounds were the most frequent (41.7%) and their median size was 20 mm [IQR 13-30]. The largest thread size (3.0 mm) was less commonly used in the music group (8.4% versus 25%; p=0.030). There was no other difference regarding the suture procedure. The median VAS for maximum pain during suturing was 25.5 mm [IQR 10-48.5] in the music group versus 20 mm [IQR 10-42] in the control group, with no significant difference (p=0.62). There were no significant differences for the secondary endpoints (Table 1).

This study has few limitations. First, this "before/after" study was not randomized and we did not collect data on eligible but not included patients, which exposes to a selection bias. However, baseline characteristics of included patients appeared similar in both groups. Second, this study was performed in a single center, giving it limited external validity. Third, this study was open and endpoints were subjective, although patient self-measurement of pain and anxiety using a VAS is a validated and reproducible method. Fourth, main outcomes exhibit wide confidence intervals which suggests a lack of power to exclude a difference between groups. Finally, we cannot exclude a time effect due to the Covid-19 pandemic; the end of stay-at-home rules during the control period and the introduction of new restrictive measures during the music period could have had a significant non-measurable impact on our results.

Our results differ from those of a randomized controlled trial published in 1991 by Menegazzi et al, which showed a significant reduction in the overall pain score in the music group than in

the control group (mean 2.09 versus 3.31, respectively).[7] Several factors may explain this difference. First, in Menegazzi et al study, only 19 patients in each group were enrolled, the observed difference could be due to chance alone. Then patients were younger and the analgesic effect of music may be greater in this age group. Their primary endpoint was the global pain experienced during the procedure whereas we chose to measure the maximum pain intensity. Listening to music could reduce the overall sensation of pain without changing its maximum intensity. Patients were given a choice of 50 audiotapes from different artists and styles, whereas we decided to limit this choice to five playlists of relaxing music. The selection of personalized music, for example through an unlimited choice of style or artist, could enhance a potential analgesic and/or relaxing effect. Finally, it is difficult to compare studies conducted in two different places and times. Studies on music therapy in the ED are scarce and assess a variety of interventions. Mandel et al reported a significant decrease in pain by implementation of interactive sessions with a music therapist in the ED and this reduction was greater in the subgroup of patients who received a technical procedure (blood test, venous catheter insertion, dislocation reduction, stitches).[3] However, implementing such complex interventions seems difficult to reproduce in the ED. In a different way, Parlar Kilic et al showed that non-personalized background music reduced the intensity of pain in patients admitted in ED for pain and triaged in relative emergency.[4] Other studies focusing on individual listening to music during waiting time have conflicting results.[5,6] In a randomized trial regarding patients presenting to an ED for a trauma, listening music through headphones allowed a significant reduction in the consumption of morphine.[6] The method of music distribution chosen in our study, through headphones, may not be the most effective during a technical procedure. Indeed, a randomized study showed a significant increase in the rate of adolescents reporting "no pain" during a vaccination when background music was played in the room but there was no difference when music was played through headphones.[9] The authors observed that patients took off their headphones to communicate with the nurse. Because of their isolation effect, headphones prevent communication between caregiver and patient. In our study, the choice of headphone broadcasting indeed created a lack of communication between the doctor and the patient during the wound closure, which could have led to a contradictory anxiety effect, as several patients spontaneously mentioned at the end of the procedure. In our study, the maximum pain intensity during the suture was low (median of 20mm [10-42]) in the control group, probably due to the effectiveness of anesthesia. In this condition, it could be difficult to show a relevant reduction in VAS. Music might be more effective in other more painful procedures. For example, Nguyen et al showed

a significant reduction in pain when performing lumbar puncture in children listening to music.[10] Therefore, despite our negative results, music interventions should be studied in different ED settings, ideally through randomized controlled trials. Music could also be a potential complement to other pain control modalities. Furthermore, other non-pharmacological analgesic measures such as hypnosis or virtual reality may also have a place in ED and should be the subject of future research.

In conclusion, our music protocol did not reduce the intensity of patients' pain and anxiety during wound closure in the ED. This could be partly explained by the limited choice of music or the use of headphones. However, music seems to have a place in EDs, either by playing background music, or during waiting times or some more painful procedures.

References

1. Mankowitz SL. Laceration management. J Emerg Med. 2017;53(3):369-82. doi:10.1016/j.jemermed.2017.05.026

2. Cepeda MS, Carr DB, Lau J, Alvarez H. Music for pain relief. Cochrane Database Syst Rev. 2006;(2):CD004843. doi:10.1002/14651858.CD004843.pub2

3. Mandel SE, Davis BA, Secic M. Patient satisfaction and benefits of music therapy services to manage stress and pain in the hospital emergency department. J Music Ther. 2019;56(2):149-73. doi:10.1093/jmt/thz001

4. Parlar Kilic S, Karadag G, Oyucu S, et al. Effect of music on pain, anxiety, and patient satisfaction in patients who present to the emergency department in Turkey. Jpn J Nurs Sci. 2015;12(1):44-53. doi:10.1111/jjns.12047

5. Tanabe P, Thomas R, Paice J, Spiller M, Marcantonio R. The effect of standard care, ibuprofen, and music on pain relief and patient satisfaction in adults with musculoskeletal trauma. J Emerg Nurs. 2001;27(2):124-31. doi:10.1067/men.2001.114386

6. Jebali C, Ibn Hassine N, Bouriga R, Mahjoub M, Bouhamed C. The impact of music therapy on morphine consumption in emergency room: A prospective randomized study [Impact de la musicothérapie sur la consommation de morphine aux urgences : étude prospective randomisée]. Douleurs. 2018;19(5):211-7. doi:10.1016/j.douler.2018.07.014

7. Menegazzi JJ, Paris PM, Kersteen CH, Flynn B, Trautman DE. A randomized, controlled trial of the use of music during laceration repair. Ann Emerg Med. 1991;20(4):348-50. doi:10.1016/s0196-0644(05)81652-x

8. Olsen MF, Bjerre E, Hansen MD, et al. Pain relief that matters to patients: systematic review of empirical studies assessing the minimum clinically important difference in acute pain. BMC Med. 2017;15(1):35. doi:10.1186/s12916-016-0775-3

9. Kristjánsdóttir Ó, Kristjánsdóttir G. Randomized clinical trial of musical distraction with and without headphones for adolescents' immunization pain. Scand J Caring Sci. 2011;25(1):19-26. doi:10.1111/j.1471-6712.2010.00784.x

10. Nguyen TN, Nilsson S, Hellström AL, Bengtson A. Music therapy to reduce pain and anxiety in children with cancer undergoing lumbar puncture: a randomized clinical trial. J Pediatr Oncol Nurs. 2010;27(3):146-55. doi:10.1177/1043454209355983

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Clément Duroux MD[1], Manon Fainelli[1], Zidane Dirhoussi[1], Alexandre Le Joncour MSc[2,3], Colombine Bonier MD[1], Cathia Zak MD[1], Raphael Cornet[4], Pierre-Alexis Raynal MD[1], Youri Yordanov PhD[1,5], Pierre-Clément Thiebaud MD[1]

[1] AP-HP.Sorbonne Université, Hôpital Saint Antoine, Service d'Accueil des Urgences, Paris, France

[2] AP-HP.Sorbonne Université, Hôpital Pitié-Salpêtrière, Département de médecine interne et d'immunologie clinique, Centre national de référence Maladies Autoimmunes et Systémiques rares et Maladies Autoinflammatoires rares, Paris, France

[3] Sorbonne Université, UPMC Univ Paris 06, INSERM, Immunologie-Immunopathologie-Immunotherapie (I3), UMR S 959, Paris, France

[4] Centre International de Musicotherapie, Peter Hess Institut, Paris, France

[5] Sorbonne Université, INSERM, Institut Pierre Louis d'Epidémiologie et de Santé Publique, UMR-S 1136, Paris, France

Corresponding author:

Pierre-Clément Thiebaud, MD
Emergency Department, Saint-Antoine Hospital, APHP.Sorbonne Université
184, rue du Faubourg Saint-Antoine 75012 Paris, France
E-mail: pierre-clement.thiebaud@aphp.fr
Phone: +33 (0)1-49-28-27-43, Fax: +33 (0) 1-49-28-25-42

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Table 1 – Patients' characteristics and outcomes

	All n=144	Control group n=72	Music group n=72	p-value
Age, median (IQR)	38 [28-55.5]	38 [29-59.5]	38 [28-53.5]	0.528
Sex, n (%)				
Female	58 (40.3)	31 (43.1)	28 (38.9)	0.611
Male	86 (59.7)	41 (56.9)	44 (61.1)	
Initial VAS score (mm), median (IQR)				
Pain	14.5 [3-30]	12 [0-25]	15 [5-33.5]	0.328
Anxiety	23 [4-50]	24.5 [13.5-50]	19 [0-49.5]	0.131
Wound localization, n (%)				
Scalp	20 (13.9)	13 (18.1)	7 (9.7)	
Face	60 (41.7)	32 (44.4)	28 (38.9)	
Limb	30 (20.8)	14 (19.4)	16 (22.2)	0.236
Hand	25 (17.4)	8 (11.1)	17 (23.6)	
Foot	9 (6.2)	5 (6.9)	4 (5.6)	
Trunck	0	0	0	
Wound size, median (IQR)	20 [13-30]	20 [18-30.5]	18 [12-30]	0.087
Operator, n (%)[a]				
Senior	10 (6.9)	8 (11.1)	2 (2.8)	
Resident	72 (50)	34 (47.2)	38 (53.5)	0.167
Student	61 (42.4)	30 (41.7)	31 (43.7)	
Anesthesia, n (%)[b]				
None	15 (10.4)	6 (8.6)	9 (12.7)	
Local	124 (86.1)	63 (90)	61 (85.9)	0.792
Locoregional	2 (1.4)	1 (1.4)	1 (1.4)	
Thread size, n (%)[a]				
3.0 mm	24 (16.8)	18 (25)	6 (8.4)	
4.0 mm	58 (40.5)	26 (36.1)	32 (45.1)	**0.030**
5.0 mm	61 (42.7)	28 (38.9)	33 (46.5)	
Number of stitches, median (IQR)	3 [2-5]	3 [2-4]	3 [2-5]	0.900
Duration (min), median (IQR)[c]	16 [10-23]	16 [10-24]	16 [10-22]	0.970
Maximal VAS score (mm), median (IQR)				
Pain	20.5 [10-45]	20 [10-42]	25,5 [10-48.5]	0.617
Anxiety	20 [3-50]	20 [1.5-45]	21 [4-50.5]	0.557
Final VAS score (mm), median (IQR)				
Pain	0 [0-14.5]	0 [0-10]	2,5 [0-16]	0.104
Anxiety	0 [0-10]	0 [0-10]	0 [0-7]	0.897

[a]n=143 (1 missing data) [b]n=141 (3 missing data) [c]n=138 (4 missing data); IQR: Interquartile range