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## **Live music can play a major role in aiding the development of preterm infants in neonatal intensive care units**

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The lack of proper auditory stimuli during the admission in a neonatal intensive care unit (NICU) may interfere with a baby's development, especially language (1). In order to prevent sensory deprivation, some studies recommend that parents should read to infants during hospital admission (2), ongoing research is also looking at the role that music can play (1).

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Data from previous research point that music not only help parent's anxiety but also improves the stability of newborns in the NICU. Live music along with Kangaroo care method has a positive effect on infants physiological parameters, especially on heart rate (3).

The Kangaroo care method is used in our NICU at the Hospital 12 de Octubre, Madrid, Spain, as studies have reported the positive effects of skin-to-skin contact (4).

Since music might have a beneficial effect on infant's medium-term and long-term development (1), and the tolerance to live music might differ between Kangaroo care and incubator care due to the distortion that the incubator can generate, in our unit we evaluated the comfort levels of preterm infants in Kangaroo care and incubator care before and after a live music session.

To evaluate the infants' comfort levels, we used the Newborn Infant Parasympathetic Evaluation (NIPE) monitor ® (Mdoloris Medical Systems, Loos, France). This is a non-invasive method that measures heart rate variability and has been used to measured comfort levels in newborns (5). A value of more than 57 indicates adequate comfort.

This research is part of the Resident Musical Interns project, which was conceived by the non-profit association "Música en Vena", they provided live music three times per week, in the morning shift for 1 hour, from 1 March 2017 to 28 February 2018. The "Música en Vena" team selected the musicians through musical audition and personal interview. The selected repertoire focused on vocal music, on occasions joined by instruments such as: guitar, kalimba, transverse flute, flute, clarinet, viola or cello. The songs did not exceed the volume of 65-70dB and included pre-composed classical music, jazz, flamenco, and improvised music; always maintaining a slow tempo of 60 beats per minute. (Fig 1)

We included stable preterm babies whose parents were present during the sessions and had given their consent to participate in the study. The NIPE recording started 10 minutes before the live music session and finished 10 minutes after.

Our unit promotes skin-to-skin care throughout the 24 hours, we decided not to randomize Kangaroo care or incubator care in order to ensure Kangaroo care method without restrictions. Parents were free to decide how to receive the sessions. We registered 72 sessions carried out with 29 preterm babies born at a median gestational age of  $28^{+5}$  weeks (range  $23^{+6} - 34^{+0}$ ) and a median birth weight of 1112g (range 455g –

2760g). The median postmenstrual age at the start of the sessions was 30 weeks (range 24<sup>+6</sup> – 41<sup>+4</sup>). Of the 72 live music sessions, 28 were provided to 20 babies in incubator care and 44 were provided to 20 babies in Kangaroo care, there were no statistical differences between groups. Infants could receive one or more sessions, in incubator care or in kangaroo care depending on their parent's choice.

There were no significant differences on comfort level before and after live music in both groups. The group exposed to live music in incubator care had a median NIPE value of 55 ±15.4 before the session and a median NIPE value of 53.1 ±11.3 after the session, with a difference of 1.8 (95% confidence interval -1.8 to 5.5, p=0.31). The group receiving Kangaroo care registered median NIPE values of 63.9 ±15.5 and 64 ±14.4 before and after the session, with a difference of -0.1 (95% confidence interval -4.0 to 3.9 p=0.98). As expected, the comfort level before and after the intervention were significantly higher in the Kangaroo care group compared to incubator care group, respectively (p= 0.02 and p=0.0001).

Our findings indicate that live music was feasible and well tolerated by preterm infants while were in incubator care or Kangaroo care sustaining their level of comfort. Since music is acquiring more presence in the NICUs as a potential intervention to improve infant's development, our results are reassuring because they didn't show a negative effect on infant's comfort. Questions were raised regarding the distortion that music might have in the incubator, and if this distortion could be stressful for the baby, our findings suggest that infants tolerate also music through the incubator.

In the future, live music could be useful for enhancing developmental outcomes in admitted newborn infants.

## **ABBREVIATIONS**

NIPE, Newborn Infant Parasympathetic Evaluation

NICU, Neonatal Intensive Care Unit

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## **CONFLICTS OF INTEREST**

All authors declare no conflict of interests.

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## FIGURE LEGEND

Figure 1. Live music performance in the NICU with an infant in KC.

**FIGURE 1**

