



Full length article

Positive effects of low intensity recorded maternal voice on physiologic reactions in premature infants



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ARTICLE INFO

Article history:

Received 12 July 2016

Received in revised form 3 November 2016

Accepted 5 November 2016

Available online 30 November 2016

Keywords:

Maternal voice

Low intensity

Premature infants

Physiologic responses

Neonatal intensive care unit (NICU)

ABSTRACT

Objective: To evaluate the effect of low intensity recorded maternal voice on the physiologic reactions of healthy premature infants in the neonatal intensive care unit (NICU).

Methods: Physiologic responses of 20 healthy preterm infants in the NICU of Shariati Hospital, Tehran, were obtained during a 15 min intervention including three 5 min periods (no-sound control, audio recorded playback of mother's voice, no-sound post-voice). The intervention was presented three times a day for three consecutive days. During each intervention, oxygen saturation (% OSPr), heart rate (HR), and respiratory rate (RR) were recorded at 1 min intervals over the 15 min and then averaged over each 5 min period, resulting in 3 averages for each variable for each intervention.

Results: Repeated Measures Analysis of Variance were employed to examine each variable separately. Over the three days, comparison of oxygen saturation over each of the three periods (before, during voice, after) revealed an increase in oxygen saturation during the voice period, compared to the pre-voice period, which persisted over the post-voice period; there were no differences between the voice and post-voice periods. Analyses of the HR and RR data showed a decrease in both variables during the voice period compared to the pre-voice period which persisted over the post-voice period. Again, there were no differences between the voice and post-voice periods.

Conclusion: Exposure to low intensity recorded maternal voice has positive effects on the preterm infants' physiologic responses.

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1. Introduction

In a normal, healthy pregnancy, the fetus develops within the uterus until delivery at term [38–42 weeks gestational age (GA)]. While in-utero, they begin to perceive sounds as early as 26–28 weeks of gestation (Chelli & Chanoufi, 2008) and by term, they can identify and differentiate their own mother's voice from a stranger's voice (Chelli & Chanoufi, 2008; Kisilevsky et al., 2003). The mother's voice is regarded as an important sensory stimulus in the intrauterine environment, playing a key role in structural and functional fetal development (Kisilevsky et al., 2009; Krueger, 2010; Verklan et al., 2014). However, when an infant is born prematurely (i.e., before term), they are not only deprived of the normal intrauterine environment

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Table 1
Demographic characteristics of infants and mother.

Maternal age (years), mean \pm SD, range	29.9 \pm 7.17(18–50)
Infant's gender, N (%)	
Male	10 (50%)
Female	10 (50%)
Gestational age (weeks), mean \pm SD, range	31.35 \pm 1.79 (30–34)
Age after birth (days), mean \pm SD, range	10.10 \pm 6.55 (3–25)
Birth weight (grams), mean \pm SD, range	1450 \pm 413 (1000–2570)
Weight on the first day of intervention (grams), mean \pm SD, range	1629 \pm 453 (1100–2650)

and the stimulatory effect of their mother's voice, but also they are exposed to elevated levels of sensory stimuli such as lights and sounds during hospitalization in the neonatal intensive care unit (NICU) (Als, 1982; Kisilevsky et al., 2003). According to several studies, such elevated levels of auditory stimulation can negatively affect the infant's cardiovascular and respiratory systems, oxygen saturation, sleep pattern, feeding, and future cognitive, behavioral, and language development (Bhutta, Cleves, Casey, Craddock, & Anand, 2002; McMahon, Wintermark, & Lahav, 2012; Wachman & Lahav, 2011).

The positive effects of the mother's voice in newborns such as better weight gain, less feeding intolerance attacks, earlier achievement of full enteral feeding, reduced attacks of apnea and bradycardia, improved sleep quality, stable vital signs, earlier discharge from NICU and larger auditory cortices have been reported in several studies (Bozzette, 2008; Cevasco, 2008; Cimino, 2009; Doheny, Hurwitz, Insoft, Ringer, & Lahav, 2012; Filippa, Devouche, Arioni, Imberly, & Gratier, 2013; Krueger, 2010; Krueger, Parker, Chiu, & Theriaque, 2010; Zimmerman, Keunen, Norton, & Lahav, 2013).

Most studies reporting the positive effects of the mother's voice have used sound levels greater than those recommended by the American Academy of Pediatrics (AAP) Committee on Environmental Health (1997). The purpose of the present study was to examine the effects of sound levels within the AAP recommended levels (i.e., \leq 50 dB).

We conducted this study to investigate the effect of low intensity recorded maternal voice on physiologic responses including HR, RR, and OSPR of premature infants during their NICU stay.

2. Material and methods

2.1. Participants

Thirty five premature infants were hospitalized in the NICU of Shariati Hospital, affiliated to Tehran University of Medical Sciences, Tehran, Iran, from January 2015 to March 2015. Infants with a history of maternal diseases (such as diabetes, preeclampsia, hypertension . . .), drug abuse or alcoholism were excluded from the study. Other exclusion criteria were neonates who had congenital anomalies; congenital hearing loss; viral, fungal or bacterial infections; metabolic disorders or diseases, intraventricular hemorrhage or other cranial pathologies; acute diseases such as asphyxia and necrotizing enterocolitis; a history of receiving mechanical ventilation, respiratory support, and oxygen intake using medicines such as cardiogenic medications and muscle relaxants. Infants whose parents were not willing to participate in the study were not included. Totally, 20 premature infants who were stable, appropriate for gestational age (AGA) with no acute disease, born between 30 and 34 weeks of gestational age and weighed more than 1000 g at birth with a minimum age of 48 h after birth were enrolled in this study. All participants passed otoacoustic emissions (OAE) and auditory brainstem response (ABR) tests according to the study protocol. All of them had intact hearing. Demographic maternal and infant characteristics are shown in Table 1.

2.2. Procedures

2.2.1. Training

A specialized NICU nurse was trained for carrying out the study protocol, monitoring the pulse oximetry, heart and respiratory devices, and recording data. Sitting in a quiet, comfortable room, the mothers were 'asked' to speak out loud to their infants in the same manner they had spoken to the fetus during pregnancy. Then, they were asked to talk into a recorder. So, every neonate just heard its maternal voice with her special words, feelings and speech. Their voices were recorded for five minutes.

2.2.2. Intervention

Before each intervention, the alarm of the devices was turned off. To ensure the authenticity of the function of the devices during the intervention, the infant's nurse was present at the bedside. In order to omit additional sounds around the participants, the intervention was performed in one of the isolated rooms of NICU where the noise and traffic were the least. The maternal voice was broadcast three times a day (at 8a.m., 1p.m. and 6p.m.) for the infants while they were alert and awake and had received nursing care before intervention.

To ensure the infants' auditory safety, the intensity of maternal voice was monitored individually for each infant to be \leq 50 dB by a sound level meter device (Bruel & Kjaer 2250, Germany) near the speaker, based on the recommendations

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