RESEARCH LETTER

EFFECTS OF MUSIC THERAPY ON PRETERM INFANTS IN THE NEONATAL INTENSIVE CARE UNIT

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A major focus for health care professionals caring for premature infants in the neonatal intensive care unit (NICU) is the identification of best practices for promoting optimal neurological/ behavioral development of these vulnerable infants. Medical and technological advances in the care of the preterm infant have greatly increased infant survival during the past decade; however, researchers have noted that medical and nursing procedures and the constant noise and other stimulation in the NICU environment are stressful for the preterm infant.[1] Such effects include increased stress responses, masking of speech input, and disturbances in sleep.[2,3] Excessive noise also has been correlated with a decrease in oxygen levels as well as with an increase in heart rate (HR) and sleep disturbances in infants hospitalized in the NICU.[4] The American Academy of Pediatrics recommended that ambient environmental noise levels in the NICU not exceed 45 dB.[5]

A number of strategies have been employed to minimize environmental stress in the NICU, including clustering of nursery activities, positioning or swaddling of preterm infants, touch/massage therapy, kangaroo care, oral sucrose, nonnutritive sucking, and music therapy. Music therapy is "the prescribed use of music and musical interventions to restore, maintain, and improve emotional, physiological, and spiritual health and well-being."[6] The purpose of this study was to examine the effects of a 15-minute live-music therapy intervention on HR, oxygen saturation, level of motor activity, behavioral distress, and behavioral state levels in premature infants in the NICU.

The study tested two hypotheses: (1) infants will exhibit a greater decrease from baseline in HR, level of motor activity, and signs of behavioral distress during and for 10 minutes after exposure to a 15-minute live-music intervention than they will exhibit during and for 10 minutes after exposure to a no-music condition; and (2) infants will exhibit a greater increase from baseline in oxygen saturation during and for 10 minutes after exposure to a 15-minute live-music intervention than they will exhibit during and for 10 minutes after exposure to a no-music condition. Additional study questions focused on describing characteristics of the infants and the environment that may have affected the infants' responses to the music intervention (the sound levels and numbers of staff members and visitors in the NICU during the music and no-music conditions; the infants' gestational ages, resuscitation requirements at birth, morbidity levels, weights, and quantity of stimulation received during the 2 hours prior to the music or no-music conditions; and changes in behavioral states before, during, and after exposure to the music and no-music conditions).

DESIGN

The design was a one-group repeated-measures crossover design in which infants served as their own controls. Because music therapy was already a standard of care in the NICU in which the study was conducted, it was not possible to use an experimental design in which infants were assigned randomly to an experimental group or to a control group.

METHODS

Data were collected on four occasions over a 2- to 4-week period beginning when the infants were 1 to 2 weeks old. On two occasions, the infants received 15 minutes of live music provided by a music therapist; on the other two occasions, the infants did not receive the music intervention. During each data collection period, data on HR, oxygen saturation, motor activity, behavioral state, and behavioral distress were collected every 30 seconds for 10 minutes before the music intervention or control period (baseline), every 30 seconds for the 15 minutes during the music intervention or control period (during), and every 30 seconds for 10 minutes after the music intervention or control period (post). The music therapy consisted of lullabies that were sung by a music therapist with guitar accompaniments. Although there was some variation in the songs, all met the criteria for a lullaby (simple, nonalerting, constant, stable, soothing, and relatively unchanging).

To minimize bias in collection of data on behavioral responses, observers who were blinded to the treatment group assignment collected baseline and postintervention data. These observers left the nursery during the 15-minute music (or control)

period, during which time the observer not blinded to the treatment group assignment collected data.

SAMPLE

The final convenience sample included 20 preterm infants who had been admitted to a neonatal intensive care unit (NICU) in an urban area in the southern United States and who met the following inclusion criteria: they (1) were 26 to 29 weeks' gestational age at birth, (2) had no congenital anomalies, (3) had not undergone surgery, (4) were not receiving pancuronium or other medication to induce muscle paralysis, (5) were being cared for in an isolette at the time of data collection, (6) were eligible to receive music therapy as part of their standard of care in the NICU, and (7) had received at least one previous session of music therapy to ensure the infant had tolerated one session.

FINDINGS

Findings indicated that there were no significant effects of the music therapy intervention on HR, oxygen saturation, motor activity, or behavioral distress levels. During the music condition, there was an increased mean percentage of time in the active sleep state from the baseline mean to the during mean and a decreased percentage of time in the drowsy state from the baseline mean to the during mean, followed by an increase on this state from the during mean to the after mean.

In addition to the two study hypotheses, the findings related to the following study questions provided data about infant characteristics and environmental characteristics that might influence infants' responses to the music intervention.

1. *What were the gestational ages and resuscitation requirements at birth of infants enrolled in the study?* The minimum gestational age at birth was 26.1 weeks and the maximum gestational age was 29.2 weeks with a mean of 27.5 weeks. Resuscitation requirement at birth was recorded upon enrollment to the study using a 3-point scale. Lower scores reflected lower resuscitation requirements. Of the 20 infants, 18 had a resuscitation requirement score of 1, meaning that the infant required resuscitation (including supplemental oxygen) at or soon after birth, but the 5-minute Apgar score was greater than 5. Two infants had a resuscitation requirement score of 3, meaning that the infant was in cardiac arrest or required prolonged attempts at resuscitation at birth or during transfer, with a 5-minute Apgar score of less than 5.

2. *Were there differences in mean sound levels and numbers of staff members and visitors before, during, and after the music therapy and control periods?* There were significant effects for period, condition, and interaction between period and condition for noise level ($P \leq .001$). The sound levels during the music condition were significantly higher from baseline to music and then significantly lower from music to postmusic conditions, confirming that the music was sufficiently loud to be audible to the infants. There were no significant differences in the number of staff members and visitors before, during, and after the music therapy and control periods, comparing the music therapy and control sessions, thus suggesting that this factor was not an extraneous variable that might have influenced the findings.

3. *Were there differences in the mean morbidity levels, weights, and quantity of stimulation scores of infants during music and control conditions?* Infant morbidity level and the quantity of stimulation received during the 2 hours before the sessions were not different for music or control sessions and thus were not extraneous variables that may have affected study outcomes.

COMMENTS

Although no deleterious effects were noted, further research is needed before music therapy can be recommended for use with preterm infants in the NICU. Music is a noninvasive, nonpharmaceutical, and relatively low-cost intervention that can be implemented at the infant's bedside. Future research should determine whether live music may be of benefit to preterm infants classified as more unstable, such as ventilator-dependent infants. Music therapy interventions may need to be even further individualized. Morris et al suggested that there is a threshold intensity that evokes a response and that this threshold varies among individuals.[7] Comparisons of this study with other investigations indicate that music therapy interventions provided for a longer period and with increased frequency also may be of benefit. Infants also may need to be exposed to music at a higher decibel level. In the current study, mean decibel difference from baseline to the intervention period in the music condition was 6 dB. The minimum detectable difference is 1 dB under ideal conditions, and a change of 5 dB is clearly perceptible.[8] There are very few studies of the infant's ability to discriminate sound intensity.

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