

MUSIC THERAPY IN NEONATOLOGY: WHAT IS KNOWN AND WHAT IS UNKNOWN?

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Abstract ►

Music therapy is a rapidly gaining acceptance in clinical setting due to its emerging supportive evidence and harmless nature of the therapy. Understanding the effects of sounds (both musical sounds and “noise”) on neonatal development, physiology, and behaviour has made it possible to apply music for therapeutic purposes in neonates.

Music therapy has showed positive effects on heart rates, blood pressure, respiratory rates, oxygen saturation, stress-reduction, pain-control, hospital stay, etc. in neonates admitted in NICUs in different studies. In NICUs, masking of ambient noise is also an important effect. Music therapy positively influences neonatal feeding behaviour and weight gain. Recorded instrumental music and vocal music (including mother’s voice) is used more commonly, however, live music therapy by qualified music therapists seems to be more promising due to obvious reasons. Mothers’ singing seems to be a convenient, acceptable and cost-effective option. Music therapy to mothers also benefits neonates. This article aims to discuss applications of music therapy in neonatology. Limitations, unanswered questions, and need for further research in Indian settings are also discussed.

Key Words: music therapy, neonates, mother’s voice.

Introduction

For centuries, musical activities have been part of most, if not all, traditions, cultures, and societies. Effects of music on human mind and body are known since ancient times, however, it is only for last few decades that there has been steady growth of scientific literature exploring influence of music on health and diseases. Scientifically, music can be considered as organized sound (vocal, instrumental, or both) and music therapy is defined, by the American Music Therapy Association (AMTA), as clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed

professional who has completed an approved music therapy program.¹

There are many applications of music therapy in neonatology, both for office practice and in NICUs. Some of them may require sophisticated equipment and qualified music therapists, fortunately, some of them do not and hence integration of music therapy into neonatology seems to be at least partially possible for pediatricians and neonatologists. This articles aims to review practical aspects of music therapy in neonates which can be helpful to practicing paediatricians and neonatologists.

Music and the neonate

For those who are unfamiliar to the field of music therapy, positive health effects of music are often perceived as “only psychological” or physiological only. However, many researchers have assessed effects of music on brains of neonates, who are naturally not conditioned to music and emotions, unlike adults. Neonates not only have innate beat perception;² they also have ability to separate pitch of sound from timbre.³ Neural architecture of even 1-day-old neonates is sensitive to changes in musical tone.⁴

In a study by Perani et al,⁴ instrumental piano music has shown to activate bilateral superior temporal gyrus (including primary auditory cortex), bilateral secondary auditory cortex, right insula, right amygdala-hippocampal complex, and some other areas. Interestingly, activation of auditory areas in left hemisphere was weaker than those in right hemisphere with the music, while altered music (the original piano music altered by modification of tones) causes less activation of auditory areas in right hemisphere than in left hemisphere. Structural manipulations of music also activated left inferior frontolateral cortex, and possibly Broca’s area. Effects of music on Broca’s area and limbic structures suggest role of music for linguistic and emotional development in infants.

Music Therapy in NICU

A preterm neonate admitted in NICU is a special case, who is under significant stress from inconvenient sounds (rather noise), unpleasant touches, painful procedures, and much more.⁵ Such stressful stimuli induce adverse behavioral and autonomic responses in neonates and may increase heart rate, blood pressure, and respiratory rate; reduce oxygen saturation and increase likelihood of apnea episodes.⁵⁻⁷

Music therapy has shown to reduce heart rate, blood pressure, and respiratory rate in preterm neonates in different studies.⁸⁻¹⁰ The type of music used by different researchers is recorded vocal music and recorded instrumental music (including music by Mozart).¹⁰⁻¹² Live music therapy in NICU by trained music therapist has an added advantage of application of entrainment (synchronization of a physiologic rhythm with an external stimulus), which can adapt music therapy to an infant’s vitals.⁹ These findings suggest potential application of music therapy in neonates with cardiorespiratory disorders. However, a single study

specifically assessing effects of recorded sedative music on premature infants with respiratory disorders did not show significant difference in heart rate, respiratory rate, and oxygen saturation as compared to control group.¹³ Hence, at present, it is known that music therapy affects vitals in stressed premature neonates admitted in NICUs, but its usefulness in those with cardiorespiratory disorders needs further research.

In addition to effects of autonomic nervous system, music therapy in NICU has shown reduced stress, reduced number and length of crying episodes, and reduced length of hospital stay.¹⁴⁻¹⁷ Music has been a great pain reliever for all ages and a study by Butt and Kisilevsky, use of recorded music positively modulated pain-related autonomic and behavioural responses in preterm neonates following heel lance.¹⁸ This is even more important for neonates in NICUs since they undergo many painful procedures including, venepuncture, lumbar puncture, etc. Music therapy is good for sleep in premature infants and live music therapy in NICUs has shown even better effects on neonatal sleep than use of recorded music.¹⁹

Sound level in NICU environment deserves a special consideration here. Although they vary depending upon design of the NICU, time of day, activities and staff in the NICU, etc. reported sound levels in NICU range from 49.5 to 89.5 dB²⁰, which exceeds the recommended level by the American Academy of Pediatrics, i.e., 45 dB. Sounds of different equipments, various alarms, etc. can further increase the “noise” in the NICU. Music does provide an important masking effect, but it should be made sure that the music used for therapy itself does not cross the safe limits. This is one of the factors that favors live music therapy by a music therapist over recorded music used in NICUs.

Music Therapy, Feeding, and Weight Gain in Neonates

Importance of establishment of breastfeeding, and of sucking-swallowing coordination in neonates, especially preterm neonates is well known. Sucking can be considered as the first rhythmic behavior, which also contributes to neurological development by facilitating internally regulated rhythms.²¹ In a study by Standley, contingent recorded music consisting of recorded lullabies has shown to increase non-nutritive sucking in premature neonates.²² Another study by the same author showed multiple benefits of musical stimulation by reciprocal lullaby singing, including weight gain.²³ A study by Caine showed that musical

stimulation in stable premature and low-birth weight neonates increased formula and caloric intake, reduced initial weight loss, and increased daily average weight as compared to controls.¹⁷

Compared to recorded music, live music therapy should be more effective in improving feeding behavior in neonates. This is because music elements, both instrumental and vocal, can be catered to neonate's vital parameters and behavior. Sucking behavior has been shown to vary with rhythm sound variations in live music therapy and several studies have shown improvement in sucking behavior, caloric intake, and weight gain using live music therapy.^{9, 19}

It is interesting to note that positive effect of music therapy on neonatal weight gain may not be only secondary to improved feeding, but also due to reduced energy expenditure.²⁴

Mother's Voice and the Neonate

It is well known that a neonate recognizes his/her mother's voice early and shows preference towards mother's voice over other voices. In environment of NICU, exposure to mother's voice has potential implications both for preterm and term neonates. A recent review concluded potentially positive developmental effects of exposure to mother's voice and has suggested future directions for research.²⁵ Segall reported significant effect of mother's voice on heart rate pattern in premature neonates in NICU environment.²⁶

Considering importance of infant-mother bonding, effects of live mother's voice or singing on neonates need to be explored, although many of the studies mentioned in this article have used recorded mother's voice as music. In addition, mother's singing could be a cost-effective music therapy intervention in neonates which is an important factor in resource-limited settings.

Music Therapy for Mothers of Neonates

Although this article does not aim to discuss effects of music therapy in mothers, effects of music therapy on increasing breast-feeding rates needs to be mentioned. A recently conducted randomized controlled trial in Rio de Janeiro showed a significant increase in breastfeeding rates among mothers of premature neonates; the effect was statistically significant up to the first follow-up visit between 7-15 days, and also showed statistically insignificant positive influence up

to 60 days after discharge.²⁷ A recent study from India has shown positive effect of music therapy on amount of expressed breast milk in mothers of premature newborns.²⁸

Stress-reducing effects of music therapy in adults are well known, and so as adverse effects of psychological stress on breast milk secretion. Hence it is rational to believe that music therapy may be effective in increasing breast milk secretions in mothers, especially stressed mothers like mothers of premature neonates and primiparous mothers.

Music Therapy and cautions in Indian Context

There is sufficient evidence to believe that music therapy has positive effects on neonates. However, quantification of the benefits and practical applications are yet unclear. Due to different types of music therapy interventions used by different researchers, it is difficult to recommend a uniform music therapy practice for a specific clinical condition at present. Some of important unanswered questions include minimum age at which music therapy should be started, type of music therapy (recorded/live, instrumental/vocal/mother's voice), method of delivering music therapy (speakers/headphones), type of music (classical/lullabies/specific sounds), etc.

Music therapy is gaining rapid acceptance in medical community as it is understood as having no side effects. This is true in most circumstances; however, this cannot be taken for granted for neonates, especially premature neonates. It is known that hair cells in internal ears of neonates are highly sensitive to loud sounds, and safe sound levels of therapeutic music for neonates must be established. Another important consideration is use of headphones to deliver music therapy in neonates, which could be a source of infections for premature neonates.

Indian scenario needs a special consideration. Music that has been used by Western researchers may not be acceptable to Indian parents due to sociocultural factors. Music therapy to be considered as an evidence-based science in India, scientific studies using Indian music in Indian hospital settings are necessary to make recommendations for music therapy practice. However, a brighter aspect is that music is a part of many Indian cultures and customs; and that mothers singing lullabies is not a new concept in many Indian societies. Hence scientific application of music for

newborns should be easily welcomed and accepted by most of families.

Future: “Fetal Music Therapy”?

The concept of fetal memory is not new.²⁹ Several studies have assessed effects of maternal music exposure during pregnancy and labor on neonatal behavior after birth. In a study By Tabarro, mothers positively reported alerting response and calming response by neonates to the music that the mothers were exposed to from fifth month of gestation onwards.³⁰ An open-label randomized controlled trial showed significant improvement in neonatal behavior, especially with respect to orientation and habituation, as a result of maternal music exposure

during pregnancy.³¹ Of course, effect of music on fetal development and on fetal behavior is an interesting field of research.

Conclusion

Music therapy has many applications in neonatology, both in NICUs and for health neonates. Potential effects of music on neonates include those on autonomic nervous system, those on brain development, those on linguistic, behavioral, and psychosocial development, and others. In many countries, music therapy is rapidly gaining acceptance in NICUs, but more research is needed to recommend evidence-based use of music for neonates in Indian settings.

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