

Leading Article

Music and the paediatrician

Manouri P Senanayake¹

Sri Lanka Journal of Child Health, 2011; **40**: 45-47

(Key words: Music; paediatrician)

Place of music in the practice of paediatrics has received scant attention although physicians and neurologists, in particular, are showing an increasing interest in this topic¹. This article attempts to highlight the link between music and child development, music as a feature in specific paediatric conditions and the place of music therapy in newborn nurseries.

Music and child development

Musicianship is a special human capability. However, the ability to make and appreciate music is common to all persons. An eminent ethnomusicologist defines musical ability as "an innate, species-specific set of cognitive and sensory capabilities, used for communication and making sense of the environment"². This definition indicates that musicality has a biological component. Like all other developmental skills, it too begins in childhood.

Children gain mastery over many fields of development through the medium of music. Language skills are learnt through song. Action songs help with motor skills. Musical games improve social development through imitation, pretend play and group activities. Even number concepts are acquired through song.

Effectiveness of music in stimulating child development has been widely researched among both normal and developmentally delayed children, with positive results in both groups. Today, music therapists are enrolled to deliver care to a range of developmental disorders.

How do children acquire musical abilities?

Children grow and develop among many day-to-day activities that are intrinsically musical. Perhaps the earliest exposure of a fetus to rhythm, is the maternal heart beat, a beat that he repeatedly hears about 26

million times! Melodious repetition to the accompaniment of rhythmical rocking causes the lullaby to bring the infant to a calm, contented state prior to sleep. This emotional response of the neonate to being lulled to sleep, indicates the innate affinity of infants to music. This receptivity of the neonate is a communication process that can be built on to enhance development, behaviour and intelligence³.

By six months of age infants distinguish changes in pitch, tempo and melodic contour⁴. Infants display enjoyment and rhythm by rocking, bouncing and clapping. The ability of infants to interpret mood as happy or sad has been researched. Martin Gardiner of Brown University claims that young infants kick, cry or become quiet according to the mood of the music listened to⁵.

Children do not learn music in isolation. Cognitive skills develop side by side. How music can be used as a cue to facilitating learning outcomes has received attention and early studies indicate that listening to classical music improves academic performance in children of normal intelligence. Some States in the United States of America distributed computer discs (CDs) of music by Mozart to newborns leaving hospital in the late 1990s and follow up studies of cognitive abilities are underway⁶.

Keyboard instruction on making-music to 3 to 5 year olds has shown significant improvement in spatial-reasoning. It has been documented that twice weekly piano lessons improve grades in mathematics and cognition in older children.

Musicianship, however, requires not only exposure to music but opportunity for participation and performance too. It has long been debated whether nature or nurture i.e. training or talent, is more important for musicianship, without a definitive answer.

At a time when music was disapproved of by religious authorities and a gender disparity in opportunities was prevalent, interesting research has

¹Professor in Paediatrics, Faculty of Medicine, University of Colombo

been carried out in Afghanistan on the musical competence of children of professional musicians and families with no musicians⁷. Even though neither group received "directed learning" there were significant differences in ability and repertory⁸.

Further, within families of musicians and within kinship groups, a gender difference was found with significantly lower abilities in girls who had lacked opportunities. These findings in Herat, Afghanistan indicate that for musical learning *both* exposure and genetic factors are important.

Music and some specific paediatric conditions

Williams syndrome and Tourette syndrome are perhaps the two best known 'syndromes' encountered by paediatricians where music is a recognizable feature.

Williams syndrome (WS) has been described by Oliver Sacks, Professor of Neurology at Columbia University as "a musical species"! Atypical sound processing in WS causes hyperacusis, which manifests in young children as a fear of certain sounds but later turns to a fascination. The increased musical responsiveness and musical abilities in WS children coupled with a unique pattern of language development have led neuroscientists and neurologists to study their brain development closely. This rare syndrome is caused by microdeletion of some twenty five genes on chromosome 7. The research findings therefore could throw light on the influence of genes on brain development, and the cerebral basis of cognition, behaviour and even creativity^{9,10,12}.

Tourette syndrome is a neurological disorder characterized by repetitive involuntary motor and vocal tics, which begin in childhood. Extravagant reactions when listening to music is well documented. Likewise music is known to help mask Tourette energy, with ticcing disappearing when participating in music making. The most often cited example for this therapeutic effect occurs when drumming¹¹.

Musicogenic seizures or music-induced seizures are classified as reflex epilepsy, triggered by sensory stimuli. This rare form of seizure disorder usually begins in teenagers or young adults and has no significant association with musicianship or musical learning. The triggering music varies from patient to patient or even within each patient. It is believed that such seizures occur when the part of the brain that processes emotions associated with the music

overlaps with areas that trigger seizures. Control is achieved with anti epileptic medication or less commonly surgery. This distressing neurological disorder has provided evidence that musical processing is multimodal and is distributed widely in both cerebral hemispheres¹³.

In contrast to musicogenic seizures, "*musical seizures*" have music as a part of the seizure i.e. a musical aura that precedes the seizure, but the seizure is not triggered by music. This occurs in "temporal lobe epilepsy" but is rarely described by children.

Music Therapy

Music therapy is defined as the clinical and evidence-based use of music interventions to accomplish individualized goals. It has been successfully used to restore speech and correct stammering. Aphasia in children due to post encephalitic or post stroke damage to Broca's area, known as Broca's aphasia, has shown remarkable improvement in expressive language, after music therapy. A form of music therapy called "melodic intonation therapy" has been subject to PET scan studies showing "significant changes in speech output due to a *right* fronto-temporal network" taking over in patients with Broca's aphasia.

It is well known that music relieves stress and anxiety. The concomitant effect of reduction in blood pressure has been referred to as the "Mozart Effect". Music in developmental therapy demonstrates interaction between auditory and motor systems.

Music in newborn nurseries

The fetus responds to outside sound at 16 weeks gestation, and this has been shown ultrasonically. Fetal hearing is known to promote synaptic sprouting of the developing brain. Music has been tried and tested in newborn nurseries and a meta-analysis of recorded music in NICU has listed many positive effects on preterm infants. They are: improved oxygen saturation levels, reduced heart rates, reduced arousal and behavioural stress responses, increased levels of quiet alert or quiet sleep states, improved parent-infant interaction, improved weight gain, and reduced length of hospitalization¹⁴. Benefits of recorded music on preterm babies also states that it "lessens pain, improves heart beat and assists in feeding"¹⁵.

With music being prescribed more and more by paediatricians and neonatologists, future research can be awaited on the comparison of live and recorded

music, different types of music, the different frequencies, durations, and decibel levels etc and their varied effectiveness in different paediatric conditions.

References

1. Burst JC. Music and the neurologist: A historical perspective. *Annals of New York Academy of Science* 2001; **930**:143-52.
2. Blacking J. Music in children's cognitive and affective development: problems posed by ethnomusicological research. In: Wilson FR, Roehmann FL, editors. *Music and Child Development*. St. Louis: MMB Music, Inc.; 1990
3. Malloy GB. The relationship between maternal and musical auditory stimulation and the developmental behaviour of premature infants. *Birth Defects: Original Article Series* 1979; **15**(7): 81-9.
4. Pickens J. Do infants perceive invariant tempo and rhythm in auditory-visual events? *Infant Behaviour and Development* 1997; **20**(3):349-57.
5. Begley S. Newsweek, Music on the mind. July 24 (2000), U.S. Edition: Available from: http://www.brams.umontreal.ca/plab/research/dossiers_vulgarisation/newsweek_musicmind/newsweek_musicmind.html?Story_ID=329414
6. Lubetzky R, Miimouni FB, Dollberg, S, Reifen R, Ashbel G, Mandel D. Effects of Mozart on energy expenditure in growing preterm infants. *Pediatrics* 2010; **125**(1): e24-e28.
7. Baily J. Professional and amateur musicians in Afghanistan. *World of Music* 1979; **21**(2):46-64.
8. Doubleday V, Baily J. Patterns of musical development among children in Afghanistan. In: Fernea EW, editor. *Children in the Muslim Middle East today*. Austin: Texas University Press; 1995. p 431-46.
9. Dykens EM, Rosner BA, Ly T, Sagun J. Music and anxiety in Williams syndrome: A harmonious or discordant relationship? *American Journal of Mental Retardation* 2005; **110**(5), 346-58.
10. Don A, Schellenberg G, Rourke B. Music and language skills of children with Williams syndrome. *Child Neuropsychology* 1999; **5**: 154-70.
11. Come together: Music and Tourette syndrome. In Sacks OW, editor *Musicophilia: Tales of music and the brain*. New York: Alfred A. Knopf; 2007. P 226-9..
12. Deruelle C, Schon D, Rondan C, Mancini J. Global and local music perception in children with Williams syndrome. *Neuro Report* 2005; **16**(6), 631-4.
13. Avanzini G. Musicogenic seizures. *Annals of New York Academy of Science* 2003; **999**: 95-102.
14. Standley JM, Moore RS. Therapeutic effects of music and mother's voice on premature infants. *Pediatric Nursing* 1995; **21**(6): 509-12.
15. Hartling L, Shaik MS, Tjosvold L, Leicht R, Liang Y, Kumar M. Music for medical indication in the neonatal period: a systematic review of randomized controlled trials. *Archives of Disease in Childhood (Fetal and Neonatal Edition)* 2009; **94**: F349-F354.